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A Study of the Cognitive Styles and Learning Preferences of Fire Service Officers

by

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Abstract

This research examines the relationship between Cognitive Style and Learning Styles of senior officers in the Fire Service and their preferences for different training delivery methods. Data has been gathered from students attending courses at the Fire Service College, in particular those attending the Divisional Command Course (DCC), which is a personal and professional development course for officers aspiring to a senior role in the Fire Service.

Three data gathering instruments were used in the research, the Cognitive Styles Analysis (CSA) (Riding, 1991), the Learning Styles Questionnaire (LSQ) (Honey & Mumford, 1982), and a questionnaire specifically designed to gather studentsô preference ratings across a range of 14 training delivery methods.

The research examines the psychological and educational derivations of models that underpin the CSA and LSQ instruments in order to help clarify the construct systems used to describe both cognitive and learning style; and to examine their relationships with other psychological constructs.

Further exploration of the relationships between cognitive and learning styles attempts to answer the question as to whether they have similar attributes and also whether the instruments have any practical predictive utility in predicting suitable delivery methodologies for training.

The data findings suggest that the officer students formed a homogeneous group with regard to cognitive style on the ówholistï analyticô dimension, the tendency for bias towards the analytic end of the scale, but were evenly distributed on the óverbaliserï imagerô dimension. The sample exhibited a more normal distribution of type with regard to learning style (using the LSQ), although there was a tendency for them to be more óreflectorô orientated than a standardized group in the general population.

The sample group showed preferences for certain delivery methods that encouraged interactive participation in the learning process but these did not appear to show any significant correlation with either cognitive style or learning style.

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CHAPTER 1

A study of the Cognitive Styles and Learning Preferences of Fire Service Officers

Introduction

Studying individual differences has been a personal interest dating from the time when I taught children of primary age. This interest has continued though it focuses now on the needs of adult learners, the complexities of their learning needs and how these are affected by their various educational backgrounds and learning experiences.

An interest in the óprogrammed learningô movement of the 1970s prompted some further study into the psychology of learning and its assessment. One particular aspect of this study examined the developmental aspects of cognitive growth in childrenôs language and mathematical development and the qualitative changes in thinking.

This study of the psychology of learning and the educational aspects of cognitive psychology were then applied during a two year research project at the National Foundation for Educational Research in which the focus was on how teachers kept records of childrenôs progress and what assessment structures and systems were used to provide the data. Schools throughout England and Wales were visited, or supplied data, for the survey. The report, Clift, Weiner and Wilson (1981), concluded with a series of recommendations derived from examples of good practice gathered during the survey.

One of the major points that emerged from the many interviews conducted with teachers was the diversity of methods used to record progress, ranging from extensive verbal reports to graphical and diagrammatical representations of data. Within individual schools, a record keeping systemôs success was due to the collaborative effort that had gone into producing the system. Discussion about a record systemôs purpose, and the educational structure that underpinned it, enabled teachers to internalize and conceptualize the assessment criteria used and thus to apply the criteria consistently. Whilst this ensured a measure of consistency within a particular school, there were few mechanisms in place to ensure reliable interpretation of the information when sent to another school.

The search for theoretical structures of cognitive development and objective measures of assessment in the field of education and training has been a continuing subject of interest since this earlier research. The search for objectivity is perhaps a vain pursuit since each assessment instrument contains some elements of subjectivity depending on the originatorôs field of focus and the research methods used for developing the instrument.

A chance piece of correspondence from the Assessment Research Unit at the School of Education, Birmingham University, opened up the opportunity to carry out some research using the recently developed Cognitive Styles Analysis (CSA), (Riding, 1991), and to use this instrument with a defined vocational group, namely senior officers in the Fire Service.

The current research has provided an opportunity to look at some other issues relating

to instruments that sample cognitive and learning styles and their underpinning theories. One of the main objectives of gathering the data using the CSA was to provide a sample cognitive style profile of a particular vocational group to add to a growing number of samples from other groups (Riding and Rayner, 1998). Accumulation of data from different samples will enable distinctive style profiles between the various vocational groups to be identified and to explore relationships between style type and the nature of the work carried out by each group.

A second objective of the research was to examine how individuals like to be taught, and how they like to learn. This aspect of the study looks at possible relationships between cognitive style (using the CSA) and learning style (using the LSQ ó Learning Styles Questionnaire ï Honey and Mumford, (1982)); and furthermore to look at possible links with studentôs preferences for types of course delivery.

My particular role on the staff at the Fire Service College, namely the Educational Development Tutor, involves providing advice to teaching staff, both uniformed and non-uniformed, about course development and methods of course delivery. The anticipated outcome of this research, therefore, is to inform the course development process, the Collegeôs Academic Advisory Board, and course development project teams.

Restructuring of progression courses will provide an opportunity for course development teams to look afresh at how courses can be delivered and how information about studentsôcognitive and learning style, their preferences for course delivery can be used to optimise the learning environment.

Context of the current research

The Fire Service College has been the principal training establishment for the education and training of officers in the UK Fire Service since it was set up during the Second World War. At the end of the war the National Fire Service, as it was then called, returned to local authority control. The College was then set up under section 23(1) of the Fire Services Act 1947 and in 1948 the College moved from its wartime site at Saltdean to Wotton House near Dorking.

Senior officer training was carried out at the Staff College at Wotton House near Dorking and focused on the command roles of officers. The more technical aspects of officer training were set up in 1967 on the site of the old RAF station at Moreton-in-Marsh, Gloucestershire, and was called the Fire Service Technical College. In 1981 the Staff College at Wotton House was closed and its operations were amalgamated with the expanded facilities at Moreton-in-Marsh under the revised title ôThe Fire Service Collegeô.

The College now provides operational command, fire prevention and specialist training for the junior, middle and senior ranks in the fire service. Industrial and business organisations, such as the petrochemical, aviation and off-shore oil industries undertake courses specifically designed for their needs. A number of international students attend courses at the College each year, many of whom benefit from using the ôhot-fireô training facilities at Moreton-in-Marsh to enhance their firefighting skills and competence in operational command.

In 1992 the College became a Trading Fund Agency within the Home Office. Since then, the financial running of the College has caused some concern; particularly with

regard to the costs of running training courses. Various financial factors have affected the Collegeôs functioning. For example, prior to agency status, the College received direct funding that was óring-fencedô by the Home Office for courses at the Fire Service College. During this period local authority brigades did not have to fund their personnel to attend training at the College. Since the College became an agency, however, these ring-fenced funds have been delegated to local authority brigades. Although in Scotland, the Scottish Office still funds courses at the College directly rather than being paid for out of delegated funding. English and Welsh brigades with delegated budgets now have the freedom of choice as to whether they spend money on training, equipment or maintaining staffing levels during an ongoing climate of spending reductions by local authorities; this resulting from stricter standard spending assessments and government formula funding of local authorities.

The consequence of this has been that the take-up of courses has fallen, and the amount of income generated for running the Fire Service College, has dropped.

Pressures of another kind, namely from the Health and Safety Executive (HSE), have been forcing brigades to improve their levels of training and hence a greater need to call on the Fire Service Collegeôs training facilities. This has come about following HSE óimprovement noticesô being placed on particular brigades where emergency incidents have resulted in fatalities. To some extent the HSE powers have worked in the Collegeôs favour, but as the result of a great loss to personnel in the service. Though such fatal tragedies in the fire service are relatively rare, the emergency work always carries an element of risk. Training officers to analyse possible risks at

incidents now forms an important part of the training programme demanded by authorities such as the HSE.

Another factor that has caused financial difficulty for the College has been the charging policy agreed with brigades. Since 1992, courses have in effect been sold at less than the cost price. Actual average costs of running a course work out at about £1200 per student per week. Brigades have been charged in the region of £650 to £750 per student/week. This arrangement has meant that the College has been losing in excess of £400 per student per week. Considering the number of students attending, between 200 and 500 per week, the shortfall is seen by the Home Office as unsustainable.

Consequently, the Home Office and the College have negotiated new financing arrangements. The Home Office is having to underwrite the difference but on a reducing basis over a period of five years after which further subsidy will cease. Therefore, under this agreement the College needs to reduce its course costs over this period.

During this period of financial constraint, discussions took place to examine the costs involved in delivering courses and to explore ways by which delivery of courses could be made more economical. Attempts at working out actual costings for the various component parts of course development, delivering courses and running practical exercises, etc. has not been an easy exercise, nor has it provided a completely accurate picture. Since the running of the College incurs a large fixed-cost component, it would not be easy to reduce the costs incurred. Running practical exercises is an

expensive component of many of the Collegeôs courses, because of the nature of hot fire training and the need to address significant health and safety issues. However, other aspects of course delivery could be examined with a view to looking at alternative delivery practices and technologies.

Cost reductions through using alternate delivery systems would not show an immediate improvement in the Collegeôs finances since there would be considerable development costs, for example, the costs of new infra-structure, and its maintenance, required for alternate forms of delivery would still form part of the present high level of fixed costs.

Since 1990, a series of studies have been commissioned to look afresh at the training needs of fire service officers. These studies include:

1. Report from the Sudbury Consultants 1990. This report looked at the roles within the fire service and the tasks required to fulfil these roles.
2. Report of the Training Strategy Group ï CFBAC-JTC, 1994. This is a comprehensive report that makes recommendations about the planning and development of training throughout the fire service.
3. Current course development research into Incident Command Decision-making ï Research carried out in conjunction with Aberdeen University.

4. The Standards Development Group, comprising a team of senior fire service personnel from the Home Office and UK Brigades, have been developing a complete role mapping of firefighting activities that can be used as a basis for planning training and as a basis for identifying training needs. The outcomes of this project will be used to redefine the training strategies, objectives and the delivery of training throughout the UK during the next decade.

In one particular brigade, some further thinking about command roles has resulted in a report entitled, õWest Yorkshire Fire Service Incident Command Systemö, (1997). This document quotes some research carried out on the processes of command decision-making, *The Psychology of Command Decision-making,* (Flin,1997) to underpin some aspects of its revised operational thinking.

Action at the College on these reports is still in progress and in some consideration of alternate methods of course delivery will be given during the redevelopment of courses to fulfil these training needs.

Current pattern of Progression Training in the UK and at the Fire Service College

The Fire Service College currently prepares fire service personnel for officer roles in the UK Fire Service. The training prepares them for various levels of command from the most junior level, Crew Command, to the most senior level, which would be a Chief Fire Officer for an English or Welsh brigade, or a Firemaster in a Scottish brigade.

Prior to attending courses at the College, students will already have had a considerable amount of basic training in their own brigades. Much of this training will have been conducted at an individual fire station or at the local brigade training centre.

Entry of prospective fire-fighters into the service is conditional on passing tests of physical fitness and strength as well as tests of proficiency in English and Mathematics and other essential skills. The latter assessments are necessary in order to determine that recruits reach a standard in these skills that will be needed to cope with the requirements of the job roles and future training. An earlier study found that traditional school and college academic qualifications were not necessarily found to be good indicators of potential officer material within the service (Willis-Lee, 1991). Despite these findings, students attending Fire Service College courses do receive a wide range of academic and practical education during their intensive period of study.

Those admitted into the service, as recruits, are trained in their local brigade for a period of up to two years and learn all the basic skills required to be a firefighter. Much of the training curriculum is based on routines and procedures laid down in the ócore curriculumô called the *Manuals of Firemanship* (comprising 16 volumes) issued by the Home Office. The next stage of progression involves studying for one of the progression examinations that are set and conducted by the Fire Services Examination Board. There are three main stages in the examination series:

1. Leading Firefighter,
2. Sub-officer,
3. Station Officer.

Once successful candidates have been accepted into the service and are undergoing progression training, some individuals do aspire to and succeed in gaining recognized qualifications at HNC, degree and post-degree levels.

However, before attending any courses at the Fire Service College, a firefighter should have at least successfully completed the Sub-officerôs examination and also have been promoted to the level of Leading Firefighter. This stipulation usually ensures that students at the College have the requisite prior knowledge and experience on which to base their further studies.

Despite these entry qualifications, students at the College come with a variety of backgrounds both within the fire service and outside in other forms of employment. Some left school with a few CSEs or óOô levels (precursors of the GCSE examinations) and have not done much in-depth study apart from that required for the

Fire Service Statutory Examinations. Others have continued their professional development and have gone on to study for diplomas and degrees. Within a course cohort, it is possible that the group will contain a wide range of educational backgrounds and therefore this poses a challenge to the tutors and instructors who try to cater for the learning needs of all the students in the group.

The training courses at the Fire Service College are also planned on a progression principle. Fire service personnel who aspire for promotion to senior roles, or who are identified by their brigade as potential officer material, are recommended to apply for places on the various progression courses at the Fire Service College beginning with the most junior course, the Crew Command Course, which is of three weeks duration.

The role of a Crew Commander is to manage a crew of firefighters on a fire appliance (fire-engine) and who is able to command an incident as a first attendance, i.e. being the first emergency personnel to arrive at an incident. The officer will be responsible for between three and five other firefighters at this stage. After satisfactory completion of the Crew Command course, and successful period of post-course experience back in brigade, the officer will then be eligible for the next stage, which will be to attend a Watch Command Course.

A Watch Commander is in charge of a group of firefighting crews at a fire station for the period of a 'watch' (a period or shift of eight hours). The Watch Commander may, after further successful experience, then aspire to progress towards the position of a Station Officer and have the overall responsibility for a fire station and its personnel.

Before taking up the Station Officer role, he/she will then be required to attend the Junior Officer's Advancement Course (JOA ï Command Level One).

In a restructuring of more senior courses, a new course is proposed (Command Level Two) that will prepare officers for the intermediate stages of command from Station Officer up to the level of Assistant and Divisional Officer. At this level, various specialist modules can be studied; these include courses such as the Fire Safety Officer course or the Hazardous Materials and Environmental Protection Adviser course.

Having attained the rank of Assistant Divisional Officer, an officer is then eligible to attend a Divisional Command Course (DCC ï Command Level Three). At this level, an officer will have reached a level of senior command and will have responsibility for a brigade division, which will cover a number of fire stations in a brigade area.

After further period of satisfactory service and responsibility, Divisional and Senior Divisional Officers can aspire to take on the most senior level of command at brigade headquarters. Those who wish to apply for these most senior roles of management must undergo an extensive and rigorous selection procedure of ôExtended Interviewsô before gaining a place on the Brigade Command Course (BCC). These interviews are conducted by Home Office inspectors and follows an Assessment Centre format.

On completion of this course, officers at this level may apply for posts such as Assistant Chief Officer or Chief Fire Officer for a brigade. These positions are equivalent to a chief executive, or deputy, of a sizeable organization. It is within this framework and context of training and professional development that the current research has been conducted.

Summary

This chapter has described the stimulus and context in which the current research has been conducted. Some aspects of previous research in which the author has been involved have provided a basis for the current research study and a stimulus to pursue a more in-depth examination of individual differences and their effect on learning.

The choice of assessment instruments and the sample subjects used in the research has been based not on deliberate selection amongst the many that exist but on the opportunities available through chance correspondence and the particular role played by the researcher as a tutor at the Fire Service College.

A brief history of the Fire Service College has been outlined from the days of its establishment during the Second World War through its moves to Wotton House near Dorking and finally to its present site in Moreton-in-Marsh. The current problems experienced by the College are described resulting from the setting up of a Trading Fund Agency based on unsound financial principles. This situation has been a catalyst in the search for cutting the costs of delivering courses to the U.K. Fire Service.

In the search for solutions to the costs of delivering courses, some studies into the training needs of the fire service have been outlined. The studies have resulted in the production of role maps that describe in detail the demands made on personnel in the service and by implication what training they will require. The role analysis exercise has prompted the need to review the current structure of courses and to plan for the future.

The present pattern of progression training in the fire service is described, which has been based on the traditional rank structure of the service inherited from the military background. The rank structure, ranging from Leading Firefighter through to Brigade Commander, is associated with a training programme and a series of promotion examinations that are conducted centrally by a statutory body, the Fire Service Examinations Board.

This provides the background context in which the research has been carried out.

CHAPTER 2

Models of Learning

Overview

This chapter examines the theories of learning that form the background to both the current research and one of the instruments used for gathering data, the Learning Styles Questionnaire (Honey and Mumford, 1982).

The background theories and models of learning and teaching that have been proposed during this century are described in order to provide a context. Some of these theories have then been used as a basis for the model of 'experiential learning' proposed by Kolb, (1984).

As these theories originate from different schools of thought, Curry (1983) proposed the ónion modelô to describe the different levels of brain function. This model will be used as a 'metaphor' and a unifying structure for describing the different levels, or layers, of functioning involved in the learning process.

The levels include an outer layer, which involves the ócenvironmental interaction and perceptualô aspects of learning and cognitive functioning; the middle layer, which is considered to be an óinformation processingô level; and the innermost layer, which comprises aspects of ópersonality and neurologicalô functioning.

The models of learning covered in this chapter contain elements that are believed to function in the outer and middle layers of the 'onion' model. They therefore cover the

more accessible, i.e. the more observable aspects of learning. The theories derive from four main schools of thought: the 'behaviourists', 'gestaltists' and 'developmentalists' and those with an 'information processing' view. The latter view takes a broader perspective that includes responses to environmental and learning conditions as well intra-individual aspects.

The experiential learning model, proposed by Kolb (1984), brings together theories that emanate from these different views of educational psychology ranging from the interactionist views of Lewin (1951) to the developmental views of Jean Piaget (1929).

The 'onion' model is also used in the following chapter 3, in which aspects of personality, cognitive style, learning style and learning strategies are examined.

Models and theories of learning

The 'onion' model – Curry

Models of learning need to be seen within the context of psychological research that has been carried out during the last century and a half. Since the field of research into learning is wide, some unifying model, or device, is perhaps helpful in understanding the different aspects covered.

One of the major difficulties in carrying out this research has been the process of negotiating the ócontruct minefieldô. That is, how labels for naming such aspects as personality constructs and style variables appear to have a variety of meanings according to how researchers have used them in their own research; and thus how they relate to their own particular research methodology and their analysis of factors.

This is a point highlighted by Curry (1983) who proposed the ónion modelô as a means of developing a conceptual framework on which learning theories and constructs could be structured and to provide a means of explaining the ñ..bewildering confusion of definitions surrounding learning style conceptualization and the concomitant wide variation in the scale of behaviours claimed to be predicted by learning style conceptualizations.ò (p.1)

In her research, Curry (1983) proposed an "empirically testable structure encompassing style concepts that have established psychometric standards." (p.1). The basic concepts, and their definitions, used in the research are as follows:

1. ***Learning*** ï Intended learning (not unintended learning) is both a process and a product. *Process* ï adaptive, future focused, holistic, affecting an individual's cognitive, affective, social and moral volitional skills. *Product* ï observable, a relatively permanent change in behaviour, or potential behaviour. The process is observable in the improved ability of the individual to adapt to environmental stimuli.
2. ***Learning style*** ï An overused term (Curry avoids using this term other than to refer to a general area of interest concerning individual differences in cognitive approach and process of learning.)
3. ***Instructional preference*** ï An individual's choice of environment in which to learn, e.g. preference for lectures versus small group situations.
4. ***Information processing style*** ï An individual's intellectual approach to assimilating information following the classic information processing model (orienting, sensory loading, short-term memory, enhanced associations, coding system, long-term storage ï (processing generalizations followed by details or detailed examples followed by generalized principle.)
5. ***Cognitive personality style*** ï An underlying and relatively permanent personality level dimension. Looking for universals across many learning instances. Habitual time to closure as a measure of 'reflectivity ï impulsivity'.
6. ***Self-concept about learning*** – An individual's conscious perception about the way he/she learns best. This affects choice among learning alternatives.
7. ***Learning strategy*** – A translation-like mechanism by which the individual copes with the particular learning environment. An individual uses a learning strategy whether or not a particular learning environment matches his/her learning style to

'translate' information from the form supplied into a form meaningful to the individual.

8. ***Learning ability*** **–** This is an individual's potential performance given a defined setting and a defined task demand.

The 'onion' model itself provides a metaphor for the inner and outer workings of the mind and cognitive functioning and comprises three main areas, or 'layers';

Outermost layer ï *Instructional preference* ï This layer interacts with the learning environment and other external features such as; student expectations, teacher expectations, etc and it is the least stable area and the most easily influenced.

Middle layer ï *Information processing style* ï This layer influences the intellectual approach to the assimilation of information. It is at the intersection between fundamental personality level of individual differences and the environmentally offered learning format choices.

Innermost layer ï *Cognitive personality style* ï This layer is defined as the individual's approach to adapting and assimilating information. It does not interact directly with the environment and it is a relatively permanent personality dimension.

The aim of Curry's research was the belief that, "é developing styles into a usable set of constructs has potential for real economic effects by improving selection, training and continuing education of professionals." (1983, p.13)

However, this chapter will focus on models of learning; the aspect of style will be explored in chapter 3.

Models of learning

Despite efforts to apply cognitive science to research about instruction there do not appear to have been any radical improvements to the design of instruction and delivery methods (Ohlsson, 1990); ñThere is little evidence that the application of our current cognitive theory can consistently produce instruction that radically increases the depth, breadth, or quality of the knowledge acquired by a large proportion of learners in a wide range of instructional topics.ò The current theories of cognition, he goes on to propose, are theories of action, rather than theories about how individuals develop fragmented pieces of knowledge into more complex concepts and principles. Existing theories provide an adequate basis for skills training but not for the development of concepts and principles that schools aim to teach, but, there are not adequate theories (as yet) about the nature of knowledge and how it is encoded.

Theories of learning and research into learning processes during the last 130 years have gone through various stages of focus since the time of the founding work of Wundt and James. The major ideas pervading the earlier part of this century have been 'social Darwinism', 'pragmatism' and 'metaphysical behaviourism' (McDonald, 1964). The latter two provide some relevant background to the current research; in particular the pragmatic and experimental views of Dewey (1910).

Four types of models of learning that have particular relevance to the current research are:

1. Behaviourism and conditioning ï which focuses on how situational and environmental conditions shape behaviour,

2. The Gestalt view ï which focuses on problem-solving insight and perceptual aspects of learning,

3. Cognitive development ï how the qualitative aspects of thinking and learning develop from childhood to adulthood,

4. Information processing view ï which encompasses areas of neuroscience and personality factors.

These óschoolsô of psychology, focus on the following main areas, (1) the behaviourist view takes a óblack boxô approach ï understanding of brain functioning is based on observable inputs (stimuli) and outputs (response); (2) the cognitive approach ï understanding the mechanisms of processing, how these develop with age and experience. A third view, which focuses on information processing, is dealt with in more detail in chapter 3 in discussion about the nature of style.

Each of these areas focuses on different aspects of the learning process; the first describes the interaction between the individual and the learning environment, the second describes the sensory inputs and the outputs, the third describes the inner processing that follows the inputs and shapes the outputs. The first and second views can be considered as aspects of the 'outer layer' in the onion model. The third view fits into the middle layer of the model.

Behaviourism and conditioning

This aspect of cognitive psychology to a large extent focuses on the outward manifestations of the learning process. Some of the early research, notably Ebbinghaus (memory retention), paved the way for researchers to look at *associative*

learning, i.e. how the experiences of situations and events lead to learning.

The behaviourist approach to the psychology of learning, notably through the work of Pavlov (conditioned stimulusï response), Thorndike, Watson, Hull, Miller and Skinner, linked the classical conditioning and stimulusï response learning to explain many aspects of human learning. Much of this early research focused on animal behaviours, which were considered to be simple examples of learning and behaviour that were easy to observe in a controlled research environment. Later these findings were extrapolated in order to help explain the processes of human learning. This view of learning was based on the premise that the more complex human behaviours are made up of many simpler behaviours, many of which could be observed in animals. This view had its critics (Braginsky and Braginsky, 1974; and Martin, 1980) who considered that stimulusï response learning was but a narrow and limited form of learning, which in the absence of regular reinforcement would lead to extinction of such learned behaviours.

Miller (1957) proposed that a theory of learning should take account of four conditions: ómotivationô, ócueô, óresponseô and órewardô. The development of programmed learning in the 1960s and 1970s was based on these views with its emphasis on the sequence, *stimulus–response–feedback–reinforcement*.

In terms of training delivery, the learner needs to be ósetô to want to learn, i.e. internally motivated based on previous interest in the subject, plus being motivated by the new material being delivered. Secondly, students must be able to identify the ócuesô within the learning materials or the lecturerôs presentation. Thirdly, students need to act upon new learning and órespondô so that they transform, apply and use the

newly acquired knowledge.

The final principal condition is one of órewardô, which can be interpreted as achieving satisfaction in learning something new or developing a new skill. The element of reward is believed to be an important one in the learning process, particularly in behaviourist terms (e.g. the work of Tolman, Hull and Skinner), since reward motivates repeated performance; this could perhaps be viewed as the element in the ólearning cycleô that keeps up the learning momentum.

The general principles of programmed learning provided a structured approach to the delivery of material to be learnt. This involved breaking down the material into small steps, providing cues and opportunities for individual learners to make responses and to provide feedback about their performance. This process encouraged and motivated learners since feedback was contingent on performance. However, by the late 1970s, programmed learning in its originally conceived form fell out of favour. However, the structural discipline has remained as a basis for course design. The ósystems approach to trainingô retained elements of the programmed learning philosophy; a methodology that is widely used in training programmes for the armed services and also promulgated in Fire Service College training for trainers courses.

The Gestalt view

The Gestalt school, which included psychologists such as Wertheimer, Koffka and Köhler, took a different view and examined how individuals perceived phenomena, and how any regularities and patterns were perceived and recognized.
Problem-solving behaviours were also of interest to Gestalt psychologists who studied

productive thinking behaviours of both humans and animals. Researchers examined how individuals organized 'figure-ground' phenomena such as geometric illusions and how they were able to mentally complete incomplete patterns and therefore demonstrate some insight. The emphasis of the Gestalt school was on perceptual aspects rather than mental processes and they considered that in terms of any particular context 'the whole is greater than the sum of its parts'.

Cognitive developmental stages – Piaget, Bruner

A different aspect of research examined how thinking and reasoning developed during childhood through to adulthood. They looked particularly at the qualitative differences in the way people think. Principal amongst the researchers in this field was Jean Piaget.

Piaget carried out a great deal of observational research on children in order to identify particular characteristics of their thinking and reasoning processes and how they formed a series of stages in conceptual development. Piaget, when working with Binet and their development of intelligence tests, was puzzled by the varied types of answers given by some children. He studied groups of childrenôs responses to particular problems. He also created particular problems for his research studies, which focused on the structures of knowledge and propositional logic (Piaget, 1953).

He noticed that children below certain ages were unable to reason out problems that involved particular intellectual processes or demanded operational thought involving multiple comparisons (Piaget, 1929).

He went on to propose a developmental model of stages, which subsequently had a significant influence on primary education and teacher education from the 1960s onwards.

Peel (1971), also looked at the qualities of response to problem situations given by adolescents. The results of research indicated that during the adolescent years not all students attained the *formal-operations level* i.e. the ability to think in abstract terms and to engage in reasoning which involved going beyond the information given.

Research by Biggs and Collis (1982) suggested some modifications to Piagetôs original theory by including the ñearly formalò stage in the earlier group of stages covered by ñconcrete operationsò. They also proposed widening the age bands for each stage. One criticism of Piaget's model concerned the strict adherence to age related stages was that it would logically indicate that highly abstract subject matter (e.g. algebra) should not be taught before a child reaches about the age of 13 years.

However, Biggs and Collis go on to point out that it is the quality of individualsô responses that give an indication of their capabilities rather than the fact they have reached a certain age. ñ....a personôs developmental stage might determine the upper limit of functioning, but a number of other reasons ï such as motivation, prior knowledge of that particular task ï would determine whether or not he always functions up to that level. Common observation would suggest that in most situations people function well below their potential maximum.ò Biggs and Collisô main concern is that teachers should not over generalize their levels of expectation based on ages and stages but to analyse responses and attainment as indicators of the way one should plan forward for pupils.

A further thought may be given as to how adultsô responses to problem tasks are worked through. For example, how many adults faced with a new problem will resort to using a strategy that involves trying by doing, or ópicturing things in the mindô, for example, rather than using a more abstract symbolic/verbal reasoning method? This research also suggests that there should be a more flexible approach to the linking of developmental stages to particular ages and a revision of the more rigid interpretation of Piagetôs ages and stages.

Jerome Brunerôs contribution to the developmental field has focused on the attainment of concepts and identifying the processes that make people more effective problem solvers (Bruner 1956, p.54). He examined how ideas, or concepts, are developed and how developmental stage influenced the mode of thinking.

The focus of study in this research, examined the way individuals encode experiences and how they are stored and used subsequently (Bruner 1966).

Bruner proposed that what individuals learn can be encoded *enactively*, *iconically*, or *symbolically*, i.e. knowledge is represented or remembered as actions, or as images or in an abstract code such as words, propositions, numbers etc. The terms *enactive* and *iconic* follow the Piagetian model closely.

These constructs represent ways of learning ranging from ólearning by doingô to ómanipulating ideas in the form of pictures as in a theoretical modelô to the level of abstraction that is based on words or other symbols.

Further studies examined the processes in concept formation and how experiences are used to modify and sharpen conceptual meanings and he also goes on to examine the

qualitative differences in perception of phenomena.. These studies also looked at the cross-cultural experiences and their influences. (Bruner et al., 1966)

Information processing view

It was realised that some of the more complex human behaviours could not be adequately explained solely by *stimulus-response* learning and neither did the Gestaltist view provide an explanation of some other aspects of learning. Another view, the *information-processing* approach to cognition, gathered strength in the 1950s and 1960s and adopted the computer rather than animals as a more appropriate processing model.

Interest in information processing grew out of some earlier research studies that examined processing speed in muscle response experiments. 'Mental Chronometry', as the studies were known, involved measuring the time required to respond to various stimuli. This is one of the basic principles that underlies the operation of the Cognitive Styles Analysis instrument that will be discussed in the next chapter.

Studies of structural linguistics, notably Noam Chomsky, and the development of language provided a window into the mind and the development of knowledge.

The development of computers were seen as analogous to the symbolic processing of human problem solving. As a model, the computer appeared to address the problem of explaining the symbolic use of language in problem solving. However, later views of cognitive psychologists believe that even the computer is but a limited 'metaphor' of the human mind.

There appear to be two main concepts in cognitive psychology: *representation* and *process.* In examining some models of learning it is important to note the interplay of knowledge on processes, i.e. how knowledge supports the processes, and how the processes help to build up knowledge.

Theories of learning applied to models of learning

Theories of learning have mainly been developed from laboratory studies in which highly specific aspects of learning have been tested. From a practical point of view learning in the world at large and in classrooms and lecture rooms does not happen in quite the same way. Three models are described below that attempt to combine aspects from the theories described above into coherent models of learning.

Gagné – Conditions and types of learning

The various models and theories of learning, outlined above, are to some extent brought together in Gagnéôs *'Conditions of Learning'* (1965, 1970, 1974, 1985). He developed a coherent model of hierarchies of intellectual skills that linked both the behaviourist and the information-processing schools of thought. In this model, the lowest levels of learning are based on *classical* and *operant conditioning.* The processes in the model are then developed through to intermediate levels that include *discrimination and concept learning.* At the higher and more complex processing level there is *rule learning* and *problem solving*. The following table (Table 2:1) describes the eight types of learning proposed by Gagné.

Table 2:1 Gagné's model of learning types

Type 1	Signal learning	A response to a signal a conditioned response. (e.g. Pavlovôs experiments with animals.)
Type 2	Stimulusï Response (Sï R)	Responses are gradually shaped through repeated action contingent with the stimulus. (e.g. Skinnerôs experiments)
Type 3	Chaining	Connecting together a sequence of two or more Sï Rs.
Type 4	Verbal association	Linking verbal labels to a stimulus object either by direct association or through some secondary link as when learning vocabulary in a foreign language.
Type 5	Discrimination learning	Learning to discriminate visually, orally and aurally. As in selecting the appropriate use of ówereô ówhereô ówearô and ówareô
Type 6	Concept learning	Ability to classify objects and situations in terms of particular attributes.
Type 7	Rule learning	A rule is a chain of two or more concepts that have a particular relationship to each other. Learning a rule from a verbal explanation is perceived to be much quicker than by ódiscovery learningô (Ausubel) providing that the base concepts are well established in the learner.
Type 8	Problem solving	Thinking out a new rule using previous experiences and learned rules in combination to meet a new situation.

With this hierarchical model and framework, it is possible to analyse tasks of complex behaviours and thus to develop a hierarchy of learning activities.

It is important to note that learning at levels 1 and 2 are very low levels of processing and Gagné considers that they do not have a significant role in school and adult learning. Formal school learning on the other hand mainly encompasses levels 4 to 8.

This particular model has been used during the 1970s as a structural framework for devising programmed learning materials. This model is perhaps now seen as representing the reproductive conception of knowledge and the quantitative outcome of learning (Lars-Owe Dahlgren, 1997), rather than a model focusing on the more qualitative aspects of learning.

Ausubel – Cognitive theory of meaningful verbal learning.

Ausubel in his major discussion and review of educational psychology (Ausubel, 1968), criticised many of the theories and models of learning developed during the earlier part of the 20th century. His main criticism focused on the degree of relevance of models of learning that had been developed in laboratory situations to the types of learning that take place in classrooms in schools and other educational establishments.

Some models of teaching have reportedly been extrapolated from these theories and models of learning (Gage, 1964). Ausubel also cites the converse argument, which has also been criticized by Smith (1960), that theories of learning can be derived from theories of teaching and instruction. Smith (1960, op.cit) uses the quote, ñif a child has not learned, the teacher has not taughtò, as an example to imply that learning and teaching are closely interlinked. However, Smith goes on to suggest that learning can take place in the absence of teaching and therefore the two are not always so closely related.

Ausubel believes that the role of educational psychology is to address the problems faced by the classroom teacher, who must:

> ñé generate interest in subject matter, inspire commitment to learning, motivate pupils, and help induce realistic aspirations for educational achievement. He must decide what is important for pupils to learn, ascertain what learnings they are ready for, pace instruction properly, and decide on the appropriate size and difficulty of learning tasks. He is expected to organize subject matter expeditiously, present materials clearly, simplify learning tasks at initial stages of mastery, and integrate current and past learnings. It is his responsibility to arrange practice schedules and reviews, to offer confirmation, clarification, and correction, to ask critical questions, to provide suitable rewards, to evaluate learning and development, and, where feasible, to promote discovery learning and problem-solving ability. Finally, since he is concerned with teaching groups of students in a social environment, he must grapple with problems of group instruction, individualization, communication and discipline.ò

(Ausubel, 1968, p.9)

In parallel to Gagnéôs óConditions of Learningô model, Ausubel identifies some different types of learning that take place in classrooms. As pointed out earlier, the lower order types of learning in the Gagné model have little relevance in the classroom situation. Ausubel, however, proposes that the óhigher-orderô categories of learning fall into two main groups, (1) *reception* and *discovery learning*, (2) *rote* and *meaningful learning*.

In the former group, the differences lie in the degree to which material is presented or discovered. In the second group, the differences lie in the degree to which material is learned by rote or is meaningful. Ausubel then suggests that these two groupings form independent dimensions of learning and goes on to dispel the commonly held view that all reception learning is rote, and all discovery learning is meaningful. He suggests examples where material that is presented can be learned meaningfully, and that there are occasions when problem-solving and discovery techniques can be rote learned. The major influence determining the degree to which learning is rote or meaningful depends upon the conditions under which the learning takes place.

Ausubelôs model of learning, apart from being based on the two dimensions described above, is also founded on some basic principles that fall into two broad areas: (1) *intrapersonal* ï i.e. factors that lie within the person, and (2) *situational* ï i.e. the external conditions under which learning takes place. The following table (Table 2:2) sets out the factors included in these two broad areas.

Table 2:2 Factors that affect learning

Intrapersonal	Situational
Cognitive structure	Practice
Developmental readiness	Instructional materials
Intellectual ability	Group and social factors
Motivational and attitudinal factors	Characteristics of the teacher
Personality factors	

Descriptors for these factors will assist in building up an understanding of Ausubelôs model, firstly the óintrapersonal factorsô:

Cognitive structure ï the substantive and organizational properties of previously acquired knowledge that are relevant for the assimilation of another learning task in the same subject field.

Developmental readiness ï the learnerôs stage of intellectual development, intellectual capacities and modes of intellectual functioning characteristic of that stage.

Intellectual ability ï the learnerôs relative level of general intelligence, verbal, quantitative and problem-solving abilities.

Motivational and attitudinal factors ï desire for knowledge, need for achievement, ego-involvement (interest), alertness, attentiveness level, persistence and level of effort.

Personality factors ï personal adjustment, level of anxiety, level of motivation and other individual differences.

The ósituational factorsô in the model are as follows:

Practice ï the frequency, distribution, method and general conditions including feedback or knowledge of results.

Instructional materials ï in terms of the amount, difficulty level, step size, the underlying logic, sequence and pacing, and the use of instructional aids.

Group and social factors ï classroom climate, co-operation and competition, social-class stratification, cultural deprivation, and racial segregation.

Characteristics of the teacher ï his/her cognitive abilities, knowledge of the subject matter, pedagogic competence, personality and behaviour.

These two groups of factors comprise the órelatively objective intellectualôand the ósubjective and interpersonalôdeterminants of learning.

Ausubel refers to the aspect of ócognitive styleôas the ñself-consistent and enduring individual differences in cognitive organization and functioning,ò (Ausubel 1968, p.170). He also attributes these differences of style to the different human behaviours such as information-storing and processing mechanisms, which will be described below.

The following cognitive processing strategies were identified: (Ausubel, op.cit. p.171)

- intolerance for ambiguity (tendency towards premature closure);
- intolerance for unrealistic experience; levellingï sharpening; need for simplification (skeletonizing, rationalizing);
- degree of cognitive differentiation;
- explication and importing detail in memory (embroidery);

- vividness of memory; long-term versus short-term memory;
- memory for particular kinds and sense modalities of experience;
- constriction or flexibility in problem-solving;
- preference for cognitive complexity or simplicity, for widely known or little known information; preference for broad or narrow categorization.

In reporting studies of childrenôs learning, Ausubel states that those with analytic tendencies tend to be more reflective and are prepared to consider alternative categorization/classification possibilities. These children tend to be less distractible and hyperactive than those who are conceptually impulsive.

Ausubel states that there is a general tendency for individuals to simplify the representations and storage of information in cognitive structure in order to reduce cognitive strain. He goes on to report the qualitative differences between ó*levellers* and *sharpeners*ô in this respect. Whereas the latter can recall anecdotal detail more readily, the former tend to remember the substantive core of meaning. The process of ó obliterative assimilationô appears to be somewhat greater in levellers than sharpeners, this is due to the greater fall-off rate at which details can be recalled.

At the time of writing (1968), Ausubel could find little evidence of the existence of ó cognitive stylesô. He did state that there was consistent evidence of differences between individuals in the way they organized the storage and processing of information. He suggested that there were three main aspects:

Progressive differentiation ï the organizing of new information within an existing and expanding hierarchical structure; the structure containing conceptual ideas of relatively greater/lesser levels of inclusion.

Cognitive reductionism or simplification ï the tendency to assimilate the general conceptual ideas but to lose, or be unable to recall, the detail. This process reduces cognitive strain.

Achieving internal consistency and congruence of ideas ï the process of selectively forgetting or misunderstanding details, or new ideas, which do not fit in with the existing meanings within the cognitive structure.

From Ausubelôs study of the research in this area, he suggests that one aspect of cognitive style, namely the wholistï analytic dimension (or, ódevellersï sharpenersôï Holzman and Klein (1954)), there appear to be qualitative differences in the way individuals store information and incorporate new information within the cognitive structure. He proposes the need for *organizers*, rather than overviews, to prepare learners for receiving new learning material.

Organizers need to be written at a different conceptual level from overviews, which merely summarise the main conceptual ideas to be covered. Overviews serve different functions for wholists, as opposed to their use by analytics, but in both cases serve the need to review the previously learned concepts for new learning to be anchored to.

For wholists, organizers will be required to review, and raise to consciousness, some of the more detailed concepts required to learn new material. Whereas for analytics, organizers may be required not only to identify which concepts will be required but also to provide an overall conceptual map, or structure, of the area to be covered.

The major theories of learning that have been examined so far provide ideas about the processes that the mind uses in building up knowledge. The model of learning described in the next part of the chapter is more pragmatic and to a large extent

describes the processes used in acquiring knowledge. The model described below utilizes several of the aspects of learning theories outlined above in formulating a process model of learning.

Model of Experiential Learning

The model of 'experiential learning' takes a fresh look at the process of learning. David Kolbôs model of óexperiential learningô (1984) arose out a perceived need to question existing practices in education and training. He suggested that the following aspects should be examined:

- A need to órectifyô conceptions about learning and the learning process.
- The learning process has become distorted firstly through órationalismô and latterly through óbehaviourismô.
- We have lost touch with our own experience as the source of personal learning and development, and in the process, lost that experiential centredness necessary to counterbalance the loss of óscientificô centredness.
- Emphasis on lifelong learning ï to replace ñfront-loadedò education (i.e. education for the young <21) because by the time the products are in employment, the knowledge may be obsolete or out of date.

In his proposed model, Kolb (1984) defines two dimensions each of which is bounded by a contrasting polar construct namely, (1) *concrete experience–abstract conceptualization*, and (2) *active experimentation–reflective observation*. He suggests that the process of learning involves interactions and transactions between these four construct types.

The following quotation provides a description of the interactions and dependencies

involved in his view of the learning process.

> ñTo begin with, notice that the abstract/concrete dialectic is one of *prehension*, representing two different and opposed processes of grasping or taking hold of experience in the world ï either through reliance on conceptual interpretation and symbolic representation, a process I will call *comprehension*, or through reliance on the tangible, felt qualities of immediate experience, what I will call *apprehension*. The active/reflective dialectic, on the other hand, is one of transformation, representing two opposed ways of transforming that grasp or ñfigurative representationò of experience ï either through internal reflection, a process I will call óintentionô, or active external manipulation of the external world, here called óextensionô. These two dimensions of learning ï prehension and transformation ï correspond directly to Piagetôs figurative and operative aspects of thought.ò (Kolb, 1984, p.41)

The origins of the "Experiential Learning" model

Kolb utilizes the work of some educational philosophers to provide a rationale and theoretical basis for his model of experiential learning. Some of the main theories have been described above and specific aspects, as applied to the 'experiential learning' model, are elaborated in this section.

In describing his model, Kolb uses the dichotomies, ótraditional v progressiveô, (listed below) outlined by Dewey (1938) as a basis for reviewing the purposes of education and training and goes on to advocate a shift of emphasis from the controlling influences of the education provider towards the lifelong instrumental value of education for the learner.

Kolb then focuses on the process of learning itself and how Lewin outlines the sequence learners generally follow in the process of action research and how they make sense of new experiences and transform them into new learning. Kolb translates the four key points contained in the Lewinian model into a learning cycle process.

The model Kolb proposes starts with the concrete experience and how this forms the basis for observation and reflection. Generalization of these reflections then combine to form abstract conceptualizations, which are then tested out through further experimentation. The latter then provides the next set of concrete experiences and so the cycle continues.

The third aspect Kolb draws in to develop his model of experiential learning is the developmental dimension such as that proposed by Piaget in which the qualitative aspects of thinking are developed. Some of the theories on which his model is based have been outlined above.

The three main theories that Kolb draws on:

1. John Dewey ï Model of experiential learning,
2. Kurt Lewin ï The Lewinian model of action research and laboratory training,
3. Jean Piaget ï Model of learning and cognitive development,

are outlined below.

1. John Dewey – Model of Experiential Learning

Dewey proposes the need for education to address the following dichotomies:

To imposition from above	is opposed to	Expression and cultivation of individuality.
To external discipline	is opposed to	Free activity.
To learning from texts and teachers	is opposed to	Learning from experience.
To acquisition of isolated skills and techniques by drill	is opposed to	Acquisition of them as means of attaining ends.
To preparation for a more or less remote future	is opposed to	Making the most of the opportunities of present life.
To static aims and materials	is opposed to	Acquaintance with a changing world.

> ñ..... fundamental unity of the newer philosophy is found in the idea that there is an intimate and necessary relation between the processes of actual experience and education.ò

Dewey visualizes how learning transforms the impulses, feelings and desires of concrete experience into higher-order purposeful action. This process ñinvolves observation of surrounding conditions, knowledge of what has happened in the past in similar conditions, and judgement that puts together what has been observed and what is recalled to see what they signify.ò (Dewey, 1938, p.69)

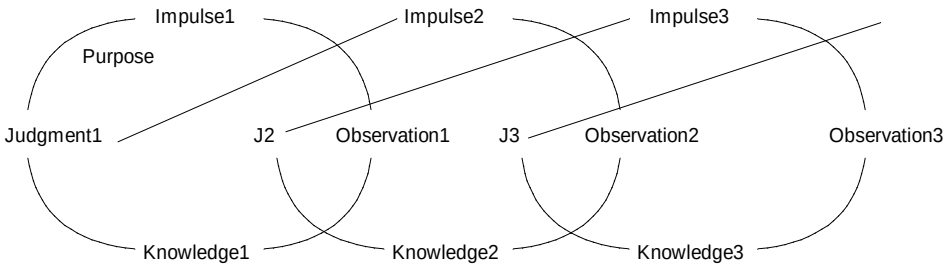

Figure 2:1 The Dewey Model

Learning is ñ... a dialectic process integrating experience and concepts, observations and action. The impulse of experience gives ideas their moving force, and ideas give direction to impulse. Postponement of immediate action is essential for observation and judgement to intervene, and action is essential for achievement of purpose. It is through the integration of these opposing but symbiotically related processes that sophisticated, mature purpose develops from blind impulse.ò (Kolb, 1984, p.22)

2. Kurt Lewin – Lewinian model of action research and laboratory training

Lewin was a social psychologist with interests in organizational behaviour. One of his major concerns was linking theory and practice. The model of experiential learning grew out of Lewinôs study of group dynamics in T-groups (Training Groups) (Lewin 1951). The emphasis of the model is on Action Research carried out in his Laboratory

Training Method. His work involved looking at, and reflecting on, planned changed interventions in small groups and large complex organizations.

> ñA discovery was made that learning is best facilitated in an environment where there is a dialectic tension and conflict between immediate concrete experience and analytical detachment. By bringing together the immediate experiences of trainees and the conceptual models of the staff in an open atmosphere where inputs from each perspective could challenge and stimulate the other, a learning environment occurred with remarkable vitality and creativity.ò (Kolb, 1984, p.9)

Lewin described action research as a spiral of steps in which there were four stages in each step:

1. Planning
2. Acting
3. Observing
4. Reflecting

Each step builds on the previous turn in the spiral to produce a series of planning episodes. At each review there is a possible need to revise plans as a result of reflecting on previous activity.

The action research model therefore provides a basis for action learning, or experiential learning. Kolb interprets this cycle of learning processes in the following diagram (Figure 2:2).

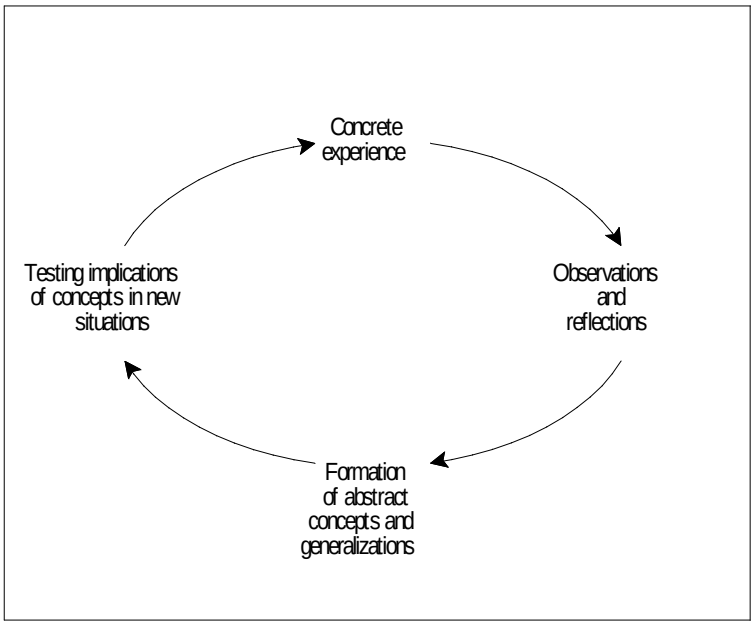

Figure 2 : 2 The Lewinian Model

There are two main stages within Kolbôs interpretation of the Lewinian Learning Model:

1. The *here-and-now* concrete experience to validate and abstract concepts.
2. The *feedback processes* ï to enable evaluation of action and to correct imbalance between observation and action.

> ñLewin and his followers believed that much individual and organizational ineffectiveness could be traced ultimately to a lack of feedback processes. The ineffectiveness results from an imbalance between observation and action ï either from a tendency for individuals and organizations to emphasize decision and action at the expense of information gathering, or from a tendency to become bogged down by data collection and analysis.ò (Kolb, 1984, p.22)

3. Jean Piaget – Piaget's model of Learning and Cognitive Development

Piagetôs interest in cognitive development has been outlined above, but Kolb refers to Piagetôs developmental research in the formulation of the theory of experiential learning.

Piaget's theory describes how intelligence is shaped by experience. Intelligence is not an innate internal characteristic of the individual but arises as a product of the interaction between the person and his or her environment. For Piaget, ñaction is the key.ò

> Abstractions, and abstract reasoning, develop out of exploring and coping with the concrete environment. ñThe growing childôs system of knowing changes qualitatively in successively identifiable stages, moving from an *enactive* stage, where knowledge is represented in concrete actions and is not separable from the actions that spawn it, to an *ikonic* stage, where knowledge is represented in images that have an increasingly autonomous status from the experiences they represent, to stages of *concrete* and *formal operations*, where knowledge is represented in symbolic terms, symbols capable of being manipulated internally with complete independence from experiential reality.ò

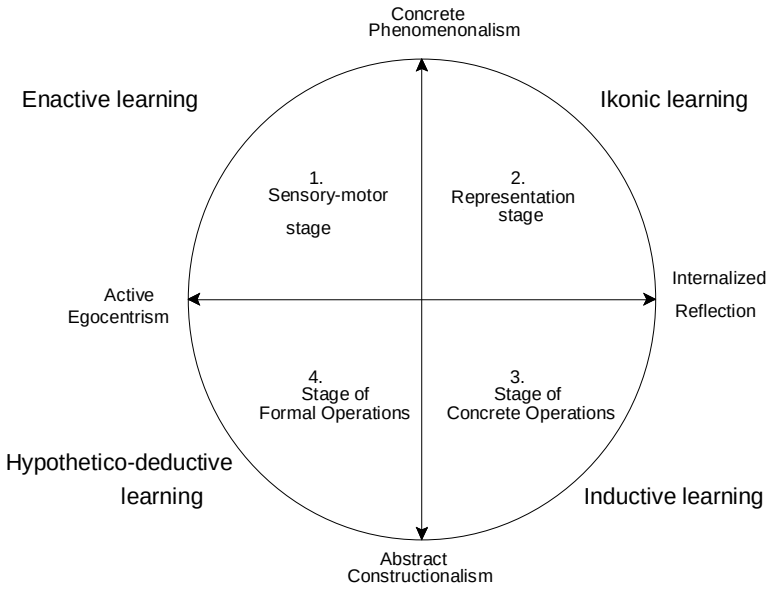

Figure 2:3 The Piagetian Model

Other models of learning referred to

In bringing together other models of learning, Kolb refers to some additional aspects of the following models of learning. Particular aspects of theories referred to earlier are included for their relevance to the model of 'experiential learning' and the current research.

Jerome Bruner

Bruner continued to apply Piagetian theory to the field of instructional design ï *Theory of Instruction* ï by suggesting that ñany idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it.ò (Bruner, 1964). He proposed that knowledge may be characterized in three ways, each affecting the ability of any learner to master it: (a) *the mode of representation* in which it is put, (b) its economy, and (c) its effective power. ñMode, economy and power vary in appropriateness to different ages, to different ósylesô among learners, and to the differences between subject matters.ò *Representation* ï Bruner suggests that knowledge can be represented in three ways: (a) by a set of actions ï *enactive representation*, (b) by a set of images or graphics that stand for a concept without defining it fully ï *ikonic representation*, and (c) by a set of logical propositions drawn from a symbolic system that is governed by rules or laws for forming and transforming propositions ï *symbolic representation*.

Economy ï refers to the amount of information that must be held in mind and processed to achieve comprehension.

Effective power ï refers to the generative value of a set of learned propositions. ñThe

effective power within a particular learnerôs grasp is what one seeks to discover by close analysis of how he is going about his task of learning.

Lawrence Kohlberg

Kohlberg extended the developmental approach of Piaget through to adolescence and adulthood by looking particularly at moral development. The initial level, ó..is preconventional morality: with a first stage of acting to avoid punishment, then a second stage based on mutual benefit. The second level is conventional morality: the first stage of this involves conforming to the norms of the peer group; whilst the second stage is a mechanical conformity to the rules / laws of society. The culminating level is postconventional morality. In the first stage of this an adult would negotiate terms with significant others; whilst in the second and final phases she could act independently of the norms if she thought it was right to do so.ò (Sutherland, 1998)

William Perry

Perry noticed that students (male undergraduates at Harvard ï late 1950s to 1960s) develop their thinking whilst at university and college and go through the following stages, or ópositionsôï *absolutist*, *authority-centred*, *right-wrong* views of knowledge (in their early college year), through stages of *extreme relativism* in their later college years, and finally to a higher stage of personal commitment (cf. Krathwohl (1964) ï affective domain level 5). The ópositionsôtaken by students are not permanent since observations show that regression takes place in the face of new, unfamiliar, intimidating situations. (Perry, 1970)

Other theories contributing to the Experiential Learning model

Kolb describes these theories as falling basically into two strands:

1. The therapeutic psychologies ï Carl Jung, Erik Erikson, Carl Rogers (client-centred therapy), Fritz Perlsô (Gestalt therapy), Abraham Maslow (Self-actualization psychology).

> ñThis school of thought brings two important dimensions to experiential learning. First is the concept of *adaptation*, which gives a central role to affective experience. The notion that healthy adaptation requires the effective integration of cognitive and affective processes is of course central to the practice of nearly all forms of psychotherapy.
>
> ñThe second contribution of the therapeutic psychologies is the conception of socioemotional development throughout the life cycle.ò

Erikson, Rogers, and Maslowôs theories of development provide a holistic framework for describing the adult developmental process and the learning challenge it poses.

In Jungôs theory ï concepts of psychological types representing different modes of adapting to the world, and his developmental theory of óindividuationô (personal fulfilment) are seen to be most useful for understanding learning from experience. In the models of psychological factors, Jung proposes three psychological dimensions ï *introversion–extraversion, thinking–feeling and sensation–intuition*. The link between psychological type and learning preferences is described in the findings of some research[1]:

> ñIn school, ninth-grade students who are extraverts prefer active learning styles such as peer teaching, projects, and simulations, whereas introverts prefer reflective learning styles, including lectures, audiovisual presentations, and learning alone. also.... students who are Judging types

[1] In S.C.Cloninger, (*Reference*: Fourqurean, J.M., Meisgeier, C. & Swank, P. (1990) refers to the link between learning style and Jungian psychological types: a finding of two bi-polar preference dimensions. (Journal of Experimental Education, 58, p.225ï 237)

> prefer to learn in more structured and quiet environments and through independent study, while Perception type students prefer unstructured, noisy environments and tactile learningò

2. *The radical educators*

The main view of the radical educators is that education is primarily an agency of social control.

Ivan Illich (*De-schooling Society* ï 1971). Illich proposed the idea that,

> ñThe deschooling of society implies a recognition of the two-faced nature of learning. An insistence on drill skill alone could be a disaster; equal emphasis must be placed on other kinds of learning. But, if schools are the wrong places for learning a skill, they are even worse places for getting an education. School does both tasks badly, partly because it does not distinguish between them. School is inefficient in skill instruction especially because it is curricular. In most schools a programme which is meant to improve one skill is chained to another irrelevant task.ò

Paulo Friere (1973) advocated the development of ñcritical consciousnessò, the active exploration of the personal, experiential meaning of abstract concepts through dialogue among equals.

> ñKnowledge only emerges through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry men pursue in the world, and with each other.ò

Education, he argues, is not a banking system where the teacher ódepositsô knowledge and the learner is a depository. This view of education restricts the learner to the role of a receiver of information, which is then filed and stored. This view does not account for such things as creativity and the transformation of knowledge. Friere also believed that people could learn to read more quickly if the reading material was ópoliticallyô relevant to the learners.

Summary

This chapter has given some detail of the background theories and models of learning that have attempted to translate theory into practice. Specific aspects of these theories have been highlighted because of their support in the development of a model of experiential learning. These theories and models have ranged from the narrow behaviourist views to the broader ranging developmental and psycho-social views.

The theories and models described are focused on the processes that mainly lie in the outer layer of the 'onion' model. In essence, the models are based on the aspects of observable learned behaviour.

The models described include those emanating from the ôbehaviourist and conditioningô researchers who consider learning as being influenced by external factors. The second school of thought, ôthe Gestaltistsô believe that learning is largely influenced by perception and the development of insight. Thirdly, there is the developmental viewpoint, which explains the growth of thinking and reasoning powers according to a set of developmental stages.

Two models that take a more eclectic view, Gagné and Ausubel, develop their theories of learning by combining elements from the more discrete ones previously described.

The theories and models used by Kolb in the development of his 'experiential learning' model have been described in greater detail since they will be revisited in chapter 3, in which the concept of learning style will be explored.

The next chapter examines the subject of cognitive style, learning style and strategies. This leads on to how these models are brought together in Kolb's model of experiential learning and the development of research into cognitive and learning style.

CHAPTER 3

Cognitive style, learning style and learning strategies

Overview

This chapter is in three main sections and will review some of the psychological research backgrounds and studies of cognitive styles and learning styles. In particular, it will include research studies that underpin the instruments used during this research.

The first section of the chapter outlines the general nature of cognitive style and is illustrated by some of the cognition-centred background theories and models. The second section will examine aspects of personality-centred and neuro-psychological aspects of style. The third section, will look at activity-centred models of learning style and strategy that link the interface between both internal and external factors of cognitive processing, and which influence how learners learn.

The fourth section brings these different perspectives together and describes two style assessment instruments used to gather data for this research, namely the 'Learning Styles Questionnaire (LSQ ï Honey and Mumford, 1982) and the 'Cognitive Styles Analysis' (CSA ï Riding, 1990).

What is cognitive style?

We are continually bombarded by a variety of stimuli form our environment during our waking lives. We probably attend to only a small range of stimuli at any one time but try to make sense of it through a coding process of categorization. "Cognitive style theorists consider that there is an identifiable consistency about the way in which each of us carries out this coding process." (Fontana, 1981). The theorists suggest that we do not drastically change our methods of solving problems, whether they be academic or social, and therefore cognitive style is considered as an integral part of our personality.

Studies of cognitive style have consequently been seen as somewhat conceptually problematical. Research in the field has been criticised for lacking the rigour and clarity of research carried out in other areas of psychology such as personality and ability (Teidemann, 1989; Carroll,1993; Furnham, 1995). Riding, Rayner and Banner, (1999) point to four key areas in which research design and conceptual flaws have led to the scepticism surrounding cognitive style research.

The criticisms are that research workers have:

- "generated a large number and bewildering array of labels purporting to being different styles,
- have used ineffective and questionable assessment methods,
- not made a clear distinction between style and other constructs such as intelligence and personality, and
- been slow to demonstrate the practical utility of style." (Riding, *et al*. 1999).

The large number of construct labels used in this field of research also leads to a great deal of conceptual confusion since the same labels have been used for indicating behaviour that are qualitatively different, and conversely similar behaviours have been given different labels.

In answering the question "what is style?" there is a need to clarify the differences between what is 'style' and what is 'ability'. Three characteristics identified by Guilford (1980) as clarifying the differences are:

- Ability is more concerned with *level* of performance, while style focuses on the *manner* of performance.
- Ability is *unipolar,* whilst style is *bipolar.*
- Ability has values attached to it such that one end of an ability dimension is valued and the other is not, while for a style dimension neither end is considered better overall.

Riding (1999) comments that, "both style and ability may affect performance on a given task. The basic distinction between them is that performance on all tasks will improve as ability increases, whereas the effect of style on performance for an individual will be either positive or negative depending on the nature of the task."

The problem of assessing style without a clear idea about what it is can be a source of philosophical problems for researchers. The various studies into cognitive style using the Cognitive Styles Analysis (Riding, 1990), for example, appear to show low correlations with instruments that assess personality (Riding and Wigley, (1997), and ability ï using the British Abilities Scale ï (Riding and Pearson, 1994; Riding and

Agrell, 1997). The problem for the researcher using these instruments is to examine how much of the behaviours are accounted for by the major factors, such as personality and/or ability factors. Therefore, could one of the residual factors be that of 'style', perhaps?

In other words, is it easier to define style in terms of what it is not? This would seem to be a psychological equivalent of the study of 'black holes' in astro-physics.

Research studies into style have appeared since about the 1940s onwards although some historic descriptions can be traced back to the ancient Greeks (Vernon, 1973). A more recent analysis of research into style (Riding and Rayner, 1998) looks in more detail at the varieties of style research, its assessment and an examination of the plethora of labels used name the style constructs.

Style theories appear to have developed though studies into four areas of psychology:

1. perception
2. cognitive controls and cognitive process
3. mental imagery
4. personality constructs

In the first area, the whole range of 'sensory systems' and how aspects of sensory inputs of sight, hearing, touch, and smell are perceived. The Gestalt 'school' referred to in chapter 2 focused particularly on perceptual aspects of information processing; the work of Witkin, et al. (1962), and later collaborative work, looked into developing the idea of a construct 'field-dependent ï field-independent'.

The second aspect of style relates to how individuals adapt to their environment and

develop attitudes to how they perceive, structure and think, and ways to control these mechanisms; this perspective introduces constructs such as 'flexible controlï constricted' 'automatization v restructuring'.

The third aspect of style, 'mental imagery', is based on how individuals represent ideas in their minds; in verbal forms of thought or in images or some kind of visual thought processes akin to a kind of mental video.

The fourth aspect of style, personality constructs, considers how characteristics of personality influence style. For example, the Jungian based Myers-Briggs Type Indicator (1978) has been used to identify personality types, and in their description of types of personality Myers and Myers (1980) describe a series of learning styles relating to 'type'.

Sternberg (1997) in collaboration with Grigerenko have classified style research and theories into three main areas; (1) cognition-centred, (2) personality-centred, and (3) action-centred, as shown in Table 3:1. The three aspects of cognitive style listed earlier ï perception, cognitive control and processes, and mental imagery ï fall into the ócognition-centredô category. The ópersonality constructsô area falls into the ópersonality-centredô category.

This general classification will be used as a structure for the remainder of this chapter on models and theories of cognitive style and learning styles.

Table 3:1 Theories of cognitive style

Cognition-centred	Field-dependenceï Independence	The degree to which individuals are dependent on the structure of the prevailing visual field or not.
	Equivalence range	Broad equivalence range ï 'levelling' (seeing things as similar), versus a narrow equivalence range 'sharpeners' (seeing things as different)
	Category width	The degree to which individuals are able to estimate widths, size and distance consistently, or not.
	Impulsivityï Reflectivity	The degree to which individuals complete tasks speedily but are tolerant of making frequent errors, as opposed to those who work more slowly but accurately.
	Compartmentalization	The extent to which individuals categorize or organize ideas or things into discrete, labelled 'boxes'.
Personality-Centred Styles	Psychological Types	Theory derives from Jung's work and developed by Myers and Myers in their Myers-Briggs Type indicator instrument.
	Energic Theory of Mind Styles	People differ in the ways they organize space and time. Concepts include: Concreteï abstract, sequentialï random. (Gregorc, 1982)
Activityï Centred Styles	Learning Styles	Kolb, 'convergingï diverging' and 'accommodatingï assimilating' dimensions.
		Dunn and Dunn (1978) ï 18 different categories under four main groupings: environmental, emotional, sociological and physical.
	Teaching Styles	Henson and Borthwick (1984) ï suggest six different teaching approaches or styles: 'task-orientated', 'co-operative-planner', 'child-centred', 'subject-centred', 'learning-centred', and 'emotionally exciting'.

Sternberg's (1997) theory of 'mental self-government' provides a view of thinking styles in which he attempts to address some of the current criticisms of cognitive style research. In proposing his new theory of 'mental self-government', he identifies ten problem areas related to theories of style, and proposes some 15 criteria, which he states need to be met in order that styles can be fitted into a stable framework. Sternberg argues that the strength of his theory lies in its ability to unify style theory into a 'clear organizing model or metaphor' (Sternberg, 1997, p.150).

However, some of Sternberg's (1997) criteria are, however, at odds with other writers about cognitive style such as Curry (1983) and Riding and Rayner (1998). For example, 'style' is considered to be a relatively permanent disposition to respond and think in certain ways, (Curry, 1983) and (Riding and Rayner, 1998), whereas Sternberg (1997) implies that style is variable, e.g. "People differ in their stylistic flexibility", "Styles can vary across the life span", "Styles are teachable".

This view of stylistic flexibility, or 'adaptability', and the possibility of change during a person's life-span has some similar threads to the cognitive style proposed by Kirton (1994). Kirton proposed a dimension of style based on the bi-polar construct 'adaptorï innovator'.

An examination of these different models will now be presented. The ócactivity-centred stylesô will be covered in the third section of this chapter in the description of learning styles.

Cognition-centred models and theories

The cognition-centred models and theories in Sternberg's classification of styles include: 'field dependenceï independence', 'equivalence range', 'category width', 'conceptual style', 'impulsivityï reflectivity', 'compartmentalization', 'conceptual integration', 'tolerance for unrealistic experiences', and 'scanning'. Although this appears to provide a wide range of possible types of style, they can be more easily rationalized once the descriptions of each construct have been examined.

Field-dependence – independence

This particular style theory focuses on the ways we see objects relative to their context, or despite their context. The origins of this construct label are linked to the work of Witkin (1964) and associate researchers going back to the late 1940s. The tests that Witkin devised have been criticised as not being pure assessments of style since they also correlate with ability, in particular 'fluid ability' (Grigerenko and Sternberg, 1995). Field-independence has also been found to be almost indistinguishable from spatial ability (MacLeod, Jackson and Palmer, 1986). This style is sometimes labelled 'globalï articulated'. Global individuals have been found in Witkin's research to be less able to separate out relevant details from irrelevant details in a given situation. By contrast, 'articulated' individuals are able to differentiate and filter out the irrelevant detail.

Equivalence range

This particular style is characterized by the way individuals categorize, or 'code' things. Labels such as 'leveller' and 'sharpener', 'lumper and splitter', 'serialist and

holist' have been used to describe the characteristics of people who see things as more alike or as very different. Levellers tend to lump things together within a general category whereas sharpeners tend to differentiate similar things into more separate categories. For example, experts in a particular field would tend to be able to differentiate objects such as trees into finer classifications. A novice on the other hand may just think of a Scots Pine as just a tree.

It may be argued that these examples may be considered to be more highly linked with ability and experience. However, a propensity to consider detail rather than the whole might be considered to be a cognitive style.

Category width

This style is characterized by the way individuals are able to perceive categories broadly or narrowly. In some ways this is not dissimilar to 'equivalence range' above except that spatial aspects such as physical size are included. The latter are exemplified by those who tend to over estimate size or consistently underestimate size.

In Kelly's 'Personal Construct Theory' (1955) both 'equivalence range' and 'category width' have parallels in his concepts of 'range of convenience' and 'organization corollary' in which individuals vary in the way they include or exclude objects, or people, from constructs. Or, the degree of flexibility in the way they use constructs can be flexible or limited. Essentially, Kelly's work is seen to be more linked with 'personality constructs' (see later section) than with cognitive style.

Impulsivity – reflectivity

Kagan et al. (1964) proposed the style of 'impulsivityï reflectivity' to describe the manner in which individuals approached problem solving situations. This style is also similar to that of 'focussingï scanning' proposed by Bruner et al. (1956). Bruner argues that extreme 'focusers' delay hypothesis-making until they have amassed sufficient evidence to support it. Extreme scanners form a hypothesis quickly and have to repeat the process when further evidence disproves their hypothesis. Overall, the reflective person tends to be slower, but more accurate; whereas the impulsive person is quicker but makes more errors.

The construct 'impulsive' is also considered to be a personality trait linked to 'psychoticism'. This assumption suggests that impulsivity is more of a personality attribute than a cognitive style. However, there is some possibility that the trait 'impulsive' can have some effect on cognitive processing as outlined above.

Compartmentalization

This style is similar to those described above that utilize the cognitive skill (or ability) of categorization. Some individuals are quick to fit people or things into particular categories; this may also be considered as stereotyping. Others are more flexible in the way they view and categorize people, situations and things.

From these examples it is possible to see that there appears to be some overlap between personality aspects and abilities depending how one views style.

According to Sternberg, style appears to be closely linked to abilities, a view he shares with Grigerenko (Grigerenko and Sternberg, 1993). This is due, they argue, to the fact that the dimensions of style illustrated have a positive as well as a negative pole. Some attributes are considered desirable whereas others are undesirable, or less desirable. As an example, órefflectivityô can be seen to be advantageous whereas óimpulsivityô is considered a disadvantage. The social desirability can be seen particularly in the way styles of approach to learning are viewed in a school situation. The fact that one is more preferred, or possibly linked more with success at school would tend to put these constructs on a continuum scale similar to abilities.

The fact that one is considered to be ógoodô and the other ôbadô suggests that it puts them outside the criterion required by a style, namely that a pure style is considered to be neither good nor bad but just different.

Alternatively, one could consider these two example óstylesô as being two completely separate scales on which individuals could be positioned somewhere along each continuum. In other words, every individual behaves with some degree of reflectivity and some level of impulsivity. However, in practice an increase in one would tend to equate with a decrease in the other, thus they would have a high negative correlation.

In comparing óabilitiesô and óstylesô, it would seem that the former can be evaluated in terms of presence or absence of an attribute; that is, one would take a quantitative approach to something that is highly prized when present. Styles, on the other hand, represent a qualitative view of the way individuals approach tasks and situations, whose positioning at either end of the style continuum is considered neither good or

bad, advantageous nor disadvantageous, but just a propensity to do certain things in certain ways.

Kogan (1973) proposed dividing styles into three types according to ñé how close they are to the abilities domain (with Type I styles closest to the abilities domain and Type III farthest away from this domain).ò However, (Sternberg, op cit) considers that this merely categorizes the problem rather than structures the solution.

The Curry (1983) model described in the previous chapter, in contrast to the Kogan taxonomy described above, takes a different view as to where style fits into the ócognitionôï ópersonalityôdimension. The Kogan view uses the óabilitiesôï ópersonalityôdimension as the basis for classifying style, whereas the Curry view appears to suggest that style has some kind of ómediatingôrole between the perceptual aspects of cognition and the personality aspects of learning response, a view shared by Riding and Rayner (1998). The debate about where óstylesôfit into the ócognitionï personalityôdomain still continues.

An alternative category system in the group of cognition-centred models of cognitive style is proposed by Riding and Rayner (1998). Their view provides an overall framework into which the cognitive styles described above can be categorized according to two main dimensions of style attributes; these are 'wholistï analytic' and 'verbalï imagery'. Examples, some of which are have already been described, of each dimension are listed below.

The Wholist–Analytic Dimension

Field dependencyï independency	Witkin and Asch
Levelling ï sharpening	Klein (1954); Gardner et al. (1959)
Impulsivity ï reflectiveness	Kagan et al. (1964), Kagan (1966)
Converging ï diverging thinking	Guildford (1967); Hudson (1966, 1968)
Holist ï serialist thinking	Pask and Scott (1972); Pask (1976)
Concrete sequential / concrete random/ abstract sequential/ abstract random	Gregorc (1982)
Assimilator ï explorer	Kaufmann (1989)
Adaptors ï innovators	Kirton (1976, 1987)
Reasoning ï intuitive active ï contemplative	Allinson and Hayes (1996)

The characteristics associated with the cognitive styles models included in the 'wholistï analytic' dimension that have not been described so far will be outlined below.

Converging–diverging thinking: Converging thinkers, or problem solvers, will tend to prefer tasks that are structured and require logical processes to solve them. The divergent thinker on the other hand will generally prefer open-ended situations that allow for some measure of creativity to be applied to solving the problem.

Holist–serialist thinkers: Holists tend to take a top-down global view of a situation and take a thematic view involving several aspects at once. The serialist will tend to take a step-by-step approach and attend to more of the detail. Pask (1984) also pointed out that the most effective learners were those who could use both approaches.

Assimilator–explorer: In their research (Martinsen and Kaufmann, 1991) they found

that assimilators preferred a structured approach to learning whereas explorers, as the construct name suggests, prefer a more open 'discovery' approach.

Adaptor–innovator: Kirton (1994) describes the differences in 'adaptorï innovator' style in terms that those who 'adapt' try to do things better, and those who 'innovate' try doing things differently. These descriptions of style take a qualitatively different stance from other concepts of style in that it looks at the ways individuals cope with the environmental aspects of learning and problem-solving. He also asserts that the personality traits developed early in a person's life are particularly stable. This particular assumption is presumably based on research that traits are influenced through hereditability, though they will be influenced in the longer term by environmental effects (Loehlin, 1992).

Reasoning – intuitive active – contemplative: Allinson and Hayes (1996) proposed a uni-dimensional model of style based on the construct 'analyticï intuitive'. The Cognitive Styles Index devised to assess this dimension of cognitive style has been based on research into characteristics of 'right brain' 'left brain' thinking. Allinson and Hayes (op cit.) suggest that right brain individuals are characterized by and 'intuitive' approach whereas left brain individuals are characterized by being 'analytic', a characteristic of which is logical reasoning and focus on detail.

The Verbal–Imagery Dimension

Abstract versus concrete thinker	Harvey et al. (1961)
Verbaliserï Visualiser	Paivio (1971); Riding and Taylor (1976); Richardson (1977); Riding and Calvey (1981)

Whereas the 'wholistï analytic' dimension focuses on the range and level of detail used

in cognitive processing, the 'verbalï imagery' dimension focuses on the coding and storage mechanisms that are used in the process of thinking. Ideas are generally of two kinds, 'concrete' or 'abstract'. It is also possible to think of general concrete ideas as generalized abstractions; for example the 'concrete' concept of a dog can be thought of as an image of one's own pet or a friend's. Or, it is possible to code the concept verbally in general terms that will differentiate it from a cat. Paivio's 'dual-code theory (Paivio, 1971, 1979) proposes two separate coding systems 'verbal' and 'imaginal'. According to this theory pictures should be better remembered than either concrete or abstract words since pictures are more strongly processed than by the verbal coding system.

An alternative view proposed by Nelson, et al. (1977) suggests a 'sensoryï semantic' model. In this model it is suggested that pictures produce better sensory codes than do words since their meaning is accessed differently.

A further view of how thought is encoded is that of 'mental models' (Johnson-Laird, 1983). Ideas in the form of models, "need be neither wholly accurate nor correspond completely with what they model in order to be useful. For example, a person's model of a television set may vary from a 'box that displays moving pictures' to a highly detailed and elaborate representation of its functioning as possessed by a skilled TV repairman." (Anderson, et al., 1996).

This view of mental modelling appears to encapsulate not only the aspects of verbal or visual encoding but also the level of detail that can be called upon depending upon a person's experience and skill. However, Johnson-Laird's original views about 'mental

modelling' focused on aspects of reasoning and deduction. He suggests that mental models are transitory entities and are constructed as needed and manipulated until a conclusion is reached, and subsequently discarded (Johnson-Laird and Byrne, 1991).

An integrated model of cognitive style has been proposed that combines the 'wholistï analytic' and 'verbalï imagery' dimensions into a single model (Riding, 1991). The basic structure of the model provides a nine cell grid as follows:

Table 3:2 Cognitive Style model – Riding (1991)

1. Analytic-verbaliser	2. Analytic-bimodal	3. Analytic-imager
4. Intermediate-verbaliser	5. Intermediate-bimodal	6. Intermediate-imager
7. Wholist-verbaliser	8. Wholist-bimodal	9. Wholist-imager

This model brings together the disparate areas of research illustrated above into a more coherent description that accounts for the way individuals are able to see 'the whole' or 'the details' and whether encoded symbolically in words or in pictorial images. Details of the assessment instrument 'The Cognitive Styles Analysis' (Riding, 1991) are described in a later section of the chapter.

Section summary

So far, a broad view of the cognitive styles field has been described. The examples given so far provide some insight into how the nature of cognitive style is perceived by different researchers in the field. Some research has focused on perceptual aspects and the problems of differentiating style and ability. Other research considers

cognitive style as one of cognitive control, process and attitude. These views are essentially 'cognition-centred' and relate to processing and coding, although the aspect of attitude will be examined again under the category of personality.

The next section of the chapter will look in more detail at some of the main areas of psychological research, in particular 'personality-centred styles', that contribute to the field of cognitive style. In the process, personality constructs, and factors, will be examined to see how the use of similar constructs in both fields has led to the conceptual 'minefield' that currently exists.

Personality-centred models and theories

In this section, two areas of research will be examined, which broadly correspond to the inner layers of the ónion modelô metaphor (Curry, 1983), namely:

- Models and theories of neuroscience
- Models and theories of personality

First of all, some aspects of neuroscience will be explored as they are fundamental to understanding the building blocks of learning; namely, perception and information processing. Aspects of personality-centred cognitive style, to continue with the Sternberg classifications used earlier, will follow since they appear to form the interface between the 'inner' mind and cognitive processing domain. These aspects will be brought together at the end of this section.

Models and theories of neuroscience

The three ólayerô onion model of cognitive functioning, used as a metaphorical prop, describes the interrelationships between the environmental factors and physiological

factors that are involved in the learning process; as opposed to a literal and physical model of the geography of the brain. The personality elements of cognitive style outlined in the next section have certain common themes in terms of how people perceive the world about them. To a large extent the reactions to stimuli are assessed through observing behaviour; this can be through either direct observation or through analysing responses to questionnaires in a verbal (oral) or written form.

A study of how external stimuli affect the neurophysiological system takes us into the realms of biochemistry and neurophysiology but to pursue this in the current research may not be very fruitful on two counts; (1) specialist knowledge and equipment would be required to examine the processes going on in the brain, and (2) the level of focus would be at a too finer level of detail to be valuable. Such focused research looks at just one part of the complex jig-saw without necessarily looking at the wider picture; assuming that adjacent parts of the jig-saw are available in order to help build up the bigger picture. The parallel with computers would be akin to understanding the processor chip circuitry as opposed to program functionality.

Of the aspects that form a useful background, the two areas of neuroscience and cognitive psychology are of interest since they focus on separate areas of functioning; (1) *neurobiological* ï on attention, learning and perception; (2) *cognitive psychology* ï on knowledge representation, problem solving and decision-making. Research in these two areas have tended to follow two parallel paths rather than a single complementary one (Haberlandt, 1994).

The Neurobiological view

Whereas neuroscience looks at the functioning of the brain, particularly examining the 'inputs' and how these relate to aspects like consciousness (Rose, 1998), cognitive psychology has focused on many of the processing aspects and the observable 'outputs'.

In relation to the processes of learning, only a brief outline of neuroscience aspects will be described; since further detail will not help with an understanding about style. In terms of cognitive style, there are two aspects of cognitive processing, (1) sub-conscious processing, and (2) conscious processing.

Many activities, particularly those of a routine nature, are processed at a level that we are not normally aware of. One particular example would be that of driving to and from work. During the journey we are probably less conscious of the route and driving the vehicle in the right direction and more conscious of other thoughts such as what lies ahead at work, or what shall I eat when I get home. Our brain would be in an aroused state even of those processing events of which we are not aware. However, if we were conscious, or aware, of all the sensory inputs that bombard us and the processing involved, our brains would rapidly suffer 'cognitive overload.ô

Many of the studies in cognitive processing research focus on aspects of conscious attention to some individual task. This is particularly so in studies that examine aspects of perception. In the process of examining cognitive style, if style is considered to be a relatively permanent propensity to do things in a certain way (Riding and Rayner, 1998, p. 7) then it is probable that these processes fall into the

area of sub-conscious level of processing; since, if we were to be conscious of our style this could imply that one could consciously do something to modify performance and act differently.

Neurological studies of the sub-conscious aspects of cognitive processing would be difficult to design and carry out; since researchers would need to be able to observe some particular aspect of behaviour and thereby in the process make the subject aware of that behaviour. The study of meta-cognitive processes is perhaps less difficult in this respect since they are reflective processes, i.e. thinking about thinking, and because of the level of arousal required in order to be aware of being aware.

Whereas a full neurobiological picture of primary processes can now more easily be obtained, research into aspects of higher cognitive functioning are more problematical since they involve iterative processes (Singer, 1998). For example, it is possible to talk about training the 'inner eye' or the 'inner ear'. This involves reflecting on primary sensory inputs that are then fed back into the perceptual memory.

> "The idea is that there are second-order processes that treat the output of the first-order processes in the same way as these treat sensory signals and that the results of these secondary, higher-order cognitive processes should also have access to effector systems and to the control of behaviour just as is the case for the primary processes." (Singer, 1998)

To proceed further down the neurobiological route, although interesting in itself, will not contribute further to the discussion about cognitive style except to consider that cognitive style possibly has a sub-conscious element, which has developed through some internal feedback mechanism.

Cognitive psychology view

The second aspect of the neuroscience view is that of cognitive psychology. This view takes knowledge in its broadest sense, and categorizes it into two main categories, (1) declarative, and (2) procedural. Also, this view considers two processing aspects of knowledge storage namely, (1) representation, and (2) organization.

Knowledge is of basically two types; (1) declarative, and (2) procedural. Essentially these are respectively 'knowing what' and 'knowing how'.

Declarative knowledge is fundamentally made up of 'concepts' of varying degrees of specificity, for example 'animal', 'sparrow'. Concepts also range from 'concrete' to 'abstract' in their nature. Procedural knowledge is based on remembering sequences of activity in the form of 'rules'. These rules connect declarative knowledge to the real world particularly in activities such as problem-solving and motor skills.

In response to sensory stimulation, inputs, the brain processes the information in these two main ways. The information that is to be stored has to be represented in some form. A computer, for example, stores information electronically in the form of binary electronic states, 0 or 1. The brain has a more flexible mechanism using both a symbolic form such as language, and a pictorial form such as images.

In terms of a representational aspect of cognitive style, it is possible to remember these concepts as 'images' of examples that have been experienced, or they can be stored in a symbolic form as 'words'. Some concepts are more easily stored in a symbolic form, particularly abstract concepts such as 'happy'. Whereas, some more common objects can be stored either as images or words depending on an individual's

preference, or relating to the context in which the information needs to be retrieved or operated on (Miller, 1996).

In terms of organization, the computer uses a system of bytes at the lowest level ranging to complete programs at the highest level. The human brain is undoubtedly more complex and organizes information in the form of 'knowledge'. The processes involved in organizing information are complex at the neurological level, and equally complex at the cognitive level. Knowledge, in the form of stored symbols and images, is probably stored in the form of 'semantic networks' (Collins and Quillian, 1969) or ómental modelsô (Johnson-Laird, 1983). The processing of a statement involves corresponding concepts to become active and the activation spreads along the links in the semantic network.

These processes will be returned to later in the chapter when the Cognitive Styles Analysis instrument (Riding, 1991) will be described.

Models and theories of personality

Sternberg (1997), referred to earlier, states that the main problem of psychological research into personality and cognitive style is the absence of an organizing theory or model for understanding styles, and how they relate to each other. He goes on to state that;

> ñEach set of styles is a separate entity unto itself, without any unifying framework that relates, say, field independence to category width, or category width to reflectivity. In this respect, the literature on styles diverges from most psychological literature, where there has been an attempt to specify a relatively more complete taxonomy, say, of abilities or of personality traits.ò

In pursuing the theme of personality and style, the role of personality factors will now be examined. First of all it is worthwhile examining some of the construct labels that abound in the fields of personality and cognitive psychology.

It is possible to observe that personality and cognitive style is many-faceted and complex; a short spell of people watching would confirm this. The words people use, i.e. construct labels, to name these behaviours could be examined and compared to find out their similarities. Although some of the labels have been referred to earlier, amongst the research literature the following bipolar dimensions can also be found that have links with personality attributes:

Authoritarianism ï dogmatism	Adorno et al (1950, *The Authoritarian Personality)*
Focusing ï scanning	Bruner, J.S. et al (1956 *A Study of Thinking*)
Field-dependence ï field independence global ï articulated	Witkin, H.A. et al (1954 *Personality through perception)*

Reflectivity ï impulsivity	Kagan, J. (1966 *Development studies in reflection and analysis*)
Extraversion ï introversion	Eysenck, H.J. (1947 *Dimensions of Personality*)
Intuition ï analysis	Myers-Briggs *(E–I dimension, 1980)* Allinson-Hayes (1988 et seq. *Cultural differences in the Learning Styles of Managers*)
Sensing ï Intuitive	Myers-Briggs (1980)
Wholist ï analytic	Riding, R. (1991 *Cognitive Styles Analysis*)
Global ï local	Sternberg, R.J. (1997 *Thinking styles*)

These are but a few of the construct classifications that appear in the research field. Riding and Cheema (1991) identified some 30 labels. Indeed the number of construct labels used in the various models of personality is even larger; and finding oneôs way through all their meanings can be tortuous. Trying to make sense of these meanings is also confusing. For example, one needs to ask the question, ñAre the behaviours that use the same label, but appear in separate models, qualitatively the same?ò

In order to answer this question, one of the important point that needs to be considered is the methodology used in the research to explore these ófactorsô and what criteria were used in gathering the data. So, the problem for the reader of research is that of understanding the qualitative differences in what appear to be identical labels, by understanding how their underlying meanings were derived.

One of the major problems in coming to an understanding of the underlying meaning of constructs is compounded by the fact that personality, cognitive and learning styles

studies use some of the same construct labels. Therefore, one probably needs to ask, ñAre cognitive styles but a sub-set of personality variables?ò

The question is difficult to answer without sufficient correlational research into the relationships between data collected from the different instruments.

Reviews of various measures, e.g. Furnham (1995), Rayner and Riding (1997) and Sadler-Smith (1997), are inconclusive in answering this fundamental question and they point to the need for more research, and correlational studies, into identifying the basic factors involved. The proliferation of instruments developed during the last 50 years has led to a ôbalkanizationô of this field of research (Furnham, 1995 op. cit.) and as a result has comparability research more complex. (The situation is almost analogous to the fluctuating movements in the currency markets and this leading to a call for common standards, or a common currency.)

The relative imprecision of spoken and written language, and particularly the ôesotericô language of personality research, presents a significant problem when it comes to communicating with people from different disciplines. The problem with using this ôspecialized languageô is summarized by Cloninger (1996),

> ôA specialized language, though, is no guarantee of scientific advance. David Funder (1991) has criticized many purported scientific personality variables for being unnecessarily ñ*esoteric*ï they are deliberately nonintuitive or even counterintuitive.ò He defends traits as appropriate concepts for scientific study of personality. Funder argues that we should study traits that are related to concepts used by ôinsightful observers,ô rather than those that are esoterically scientific.ô

Another difficulty in assessing and describing personality in general, is that of identifying the factors that determine behaviours; similar problems also arise when

describing cognitive style. Leading on from this there is the question as to what factors of behaviour are determined from within the person and to what are externally determined? One method for testing out which of these factors is primarily responsible are the research studies of twins. Studies of twins have examined links between both genetically determined factors and environmental factors (Rose *et al.*, 1988) and also specific gene combination differences between identical and fraternal twins (Pederson *et al.*, 1988). From these, and other studies, there appears to be some genetic and biological determinants of personality.

Similarly, other research studies point to environmental factors; these are essentially based on studies of social interactions that affect how individuals behave in a social context. Personality ótraits reflect the mutually-negotiated construction of the meaning of acts within this dynamic social interactionô (Deary and Matthews, 1993).

One of the main aims of psychological research in the field of personality has been the attempt to find a consistent model on which to base future research; in effect to identify a stable framework on which to build psychological theory. Digman and Inouye (1986) reported a series of research studies that supported a theory that, óthe domain of personality descriptors is almost completely accounted for by five robust factors.ô Cattell (1995) discusses the merits and fallacies of the five-factor theory by maintaining that research findings do not confirm the same five factors in each study. The 16 Personality Factor model (Cattell, 1973) has been confirmed by his further research (Cattell, 1995).

A more recent review of personality models (Hampson, 1999) considers that the main models of personality used currently are based on either three, five or 16 factors. In her review she weighs the evidence for and against each of the models. In general, the supporting evidence favours the 'The Big Five'; since this model appears to be able to account for the majority of factors identified within the other models.

New concepts such as 'social cognitive units' have also been proposed (Mischel and Shoda, 1995, 1998) in which situational factors are considered to affect individual behaviour patterns. One has probably noticed for example how a 'normally' introverted person can in certain situations behave more extrovertly. There are still many unanswered questions relating to personality assessment and new areas such as molecular genetics and psychobiography will widen the field even further (Hampson, 1999).

The next section examines the background to some of the more major of these personality models and their links with cognitive style.

Factorial studies of personality

The topics of personality, cognitive style and learning style have received considerable attention in the last 50ï 60 years. Models of personality have been developed by researchers who have observed and studied outward manifestations of behaviour and subjected their data to statistical analysis to identify what are thought to be some of the common factors. As a result of the many factorial studies carried out, there have been proposals for models comprising; 3ï factors (the óBig Threeô Eysenck and Eysenck (1985) ï 1. extraversion, 2. neuroticism, 3. psychoticism), 4ï factors (Kline

and Barrett (1983) 1. extraversion, 2. anxiety, 3. tough-mindedness; and 4. obsessionality), 5ï factors (the ôBig Fiveô Costa, McCrea and Dye (1991), Deary and Matthews (1993), Furnham, Jackson, Forde & Cotter (1995) ï 1. neuroticism, 2. extraversion, 3. openness, 4. agreeableness and 5. conscientiousness), and a 16-factor (16PF Cattell 1973) model of personality.

Applying labels to these factors is largely a subjective task resulting from detailed observation and analysis. Consequently, the interpretation of their meaning can only be gained if one is aware of the methods used for gathering and analysing the data.

In this particular study I shall not focus on the merits, or disadvantages, of 3ï factor, 4ï factor, 5ï factor or 16ï factor models but just to emphasise that personality constructs can have a range of interpretations.

Whilst research continues in the field of personality, there may be some optimism expressed that the ôBig Fiveô factor model is proving to be consistent (Costa & McCrea, 1993; Hampson 1999), though some caution needs to be observed (Cattell 1995). In Cattellôs discussion he points out that some of the underlying principles of factor analysis have not been fully understood by researchers. Kline (1993) analyses the basic problem as follows;

> ñFactoring any set of items can produce factors which load on items essentially semantically similar. Such factors are bloated specifics (Cattell, 1978) and many social psychological scales are of this kind. This problem, of the meaning of factors in personality inventories, from validated factors to tautologous sets of items, bedevils questions concerning the number of personality factors. In truth there can be as many factors as item writers can construct from groups of similar items. That is why ..... all personality factors should be identified not from their factor loadings but from their correlations with external criteria.ò

It is the lack of a unifying structure and the absence of correlational data of the various instruments with external criteria that leaves this area of research without stable anchors or referents. In addressing this problem, Kline and Barrett (1983) carried out cross-correlational studies of a number of personality assessment instruments. They concluded that four major factors account for the normal personality behaviours, though err on the side of caution in cases of abnormal behaviour by suggesting the probability of further factors.

There appear to be several approaches to the ócclassificationôof personality and behaviour, of which three are selected for comment as to their relevance to the current research study.

1. *Realism* ï observation of the physical manifestations of behaviour that correspond to aspects of personality.
2. *Social constructivist* ï a view that assumes personality concepts are a result of socially created constructs and provide an insight into how we understand ourselves and others.
3. *Interactionist view* ï an individualôs behaviour is determined partly by their personal traits and partly by the context in which the behaviour takes place. Situations influence people, but they do not influence everyone in the same way. (See Magnusson, 1990)

The órealismôview of personality focuses on what is sometimes termed óthe biological, or biochemical, basis of behaviourô. This view is probably more akin to computer programmerôs view of how computers work and whose interest is in the bits and bytes and coding aspects of programming.

In the 'social constructivist view', aspects of individualsôpersonalities are seen as a reflection of the way they perceive the world around them. In Kellyôs óPersonal

Construct Theoryô (1955) each person constructs their own version of their world and their view of reality. Kelly proposes a model for looking at individualsô construction of reality. In his theory, a description of órealityô is built up in terms of hierarchically linked sets of bi-polar constructs, e.g. *ugly–beautiful, out-going–shy, good–bad*. Researchers and writers on cognitive style also use many similar examples of bi-polar constructs to describe the range of behaviours observed in population samples (Rayner and Riding 1997, pp. 8ï 9).

One of the difficulties with interpreting the labels used in learning and cognitive style research, in common with areas of personality, is the difficulties that arise in understanding the construct labels used. Possible reasons why these confusions can arise have already been described in the previous section in terms of Kellyôs personal construct theory (Kelly, 1955). Whereas Kelly's theory looks at how individuals perceive and describe their own world, the 'interactionist' takes a wider view.

In the *interactionist's* view, the description and assessment of personality is seen as a being more complex. The process of personality assessment takes into account all the contextual and environmental factors within which the individual interacts, as well as the mental state of the individual, which also might have an influence on the results. Because of the complexity of the interactionistsô view of personality, Bentall (1993) expresses some scepticism about the utility of the more simplistic personality trait factors view, especially in the clinical psychotherapy field. He states that, as a clinical psychologist, the first stage in dealing with a client involves analysing the problems as seen by the client rather than being, in effect, ópigeon-holedô or 'compartmentalized'

by the therapist into a series of personality traits.

This clinical psychology perspective view of the óscience of personalityô being *value-free* appears to be counter to those views, such as those expressed by Kline (1993), and those who are searching for greater clarification and increased óprecisionô in the assessment of personality.

To recapitulate the point raised earlier, whilst the range of descriptions for the classification and assessment of personality is wide, it is only through reading researchersô reports about how data was gathered, the descriptors used, how the data has been factorized and how their meanings have been refined, that the reader can arrive at a clearer concept of what the personality constructs represent. Kline (1993) suggests that "personality factors should be identified not from their factor loadings but from their correlations with external criteria." This clarification of concepts is necessary if our understanding is to have common meaning.

Cognitive style and personality factors

In order to bring the strands of personality and cognitive styles together, a return will be made to the Sternberg category of ópersonality-centredô style.

Two sub-categories are proposed, namely; (1) Psychological types, and (2) Energic theory of mind styles.

Psychological types

Of the factorial theories of personality examined above, Sternberg (1997) only cites the Jungian based ôMyers-Briggs Type Indicator (MBTI)ô (Myers, 1978) model of personality as a model of style. The focus is on the differential óstylesô used by people who are categorized as óextrovertô or óintrovertô, those who tend to be óintuitiveô or ósensingô, or óthinkô rather than ófeelô, and those who óperceiveô rather than ójudgeô. The 16 types identified in the model do appear to help to describe individuals in the way they approach tasks and other people.

To some extent this model examines the characteristics of the interface between the individual and the environmental context and therefore in the ónionô model terms appears to explain processes in the middle to outer layers. A description of ólearning stylesô (Myers and Myers, 1980) would appear to support a view that the model focuses more on approaches to learning rather than cognitive style.

Energic theory of mind styles

In the classification of style, Sternberg only uses one model to exemplify this particular aspect of style. He proposes Gregorcôs model of how people tend to learn,

i.e. ócreteôï óractôand ósequentialôï órandomô. Sternberg describes this style in terms of how individuals organize ótimeôand óspaceô. This model suggests that people tend to prefer to think either in terms of ócreteôideas or in a more óractôand metaphorical mode. They may also prefer to work sequentially or in a much freer mode according to how they feel emotionally.

It is probably appropriate to remind oneself at this point that Sternberg is proposing a model of óhinkingôstyle rather than ócitiveôstyle. However, there are some elements that relate to cognitive style, which will be raised later on.

Section summary

In this section personality-centred aspects of cognitive style have been described. Personality is seen as being both biologically as well as socially and environmentally shaped. The neurobiological determinants of personality are seen as affecting mood and general aspects of behaviour but are not particularly useful in studying cognitive style.

The cognitive psychology view on the other hand does focus on processes that do influence style, namely aspects of perception and encoding. However, in studying the dimensions of cognitive style constructs, one is never far from the attributes of personality. Some labels are used for both personality and attributes of style.

The factorial studies of personality, the 'big three' or the 'big five' contain factors that correlate highly with dimensions of cognitive style, e.g. impulsivityï reflectivity, and extroversionï introversion. Finally, there is a brief summary of Sternberg's classification of personality-centred styles

Learning styles

This section of the chapter will look at aspects of learning style. It is important first of all to understand what 'learning style' is and how this differs from 'cognitive style'. Riding and Rayner (1998) in helping to clarify the concept state, "learning style should be understood to refer to an individual set of differences that include not only a stated preference for instruction or an association with a particular form of learning activity but also individual differences found in intellectual or personal psychology." (p.51). Another definition, also referred to by Riding and Rayner, is from Griggs (1991), who defines 'learning style' as "the composite characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment."

Riding and Rayner (1998) go on to classify the models of style in four categories:

- The learning process ï based on experiential learning
- The learning process ï based on orientation to study
- Instructional preference
- Cognitive skills and learning strategy development

The first three focus on the individual differences in the process of learning between individuals. The fourth category has a different emphasis and focuses on the individual and the profile of differences between a person's developing cognitive skills.

In Sternbergôs model described above, there are some common elements that relate more closely to learning styles than cognitive styles. He divides the category óactivity-centred stylesô into two sub-categories; (1) learning styles, and (2) teaching styles.

Riding and Rayner (1998) categorize learning styles in a different way, as follows:

- Style models based on the learning process
- Style models grounded in orientation to study
- Style models based on instructional preference
- Style models based on cognitive skills development

Sternberg illustrates his first category (learning styles) with three theories of learning, namely; Kolbôs model of ôExperiential Learningô (Kolb, 1984), Dunn and Dunn (1978) ôLearning Style Inventoryô, and Hollandôs (1973) ôTheory of careersô. Few examples are used to illustrate the categories of learning styles models as compared with the Riding and Rayner (op cit.) classifications. Kolb's model of 'Experiential Learning' is one based on the learning process. Kolbôs theory will be described in more detail in a later section in connection with the development of the Honey and Mumford 'Learning Styles Questionnaire. The Dunn et al. model, although classified as a learning style by Sternberg, Riding and Rayner class this one as being based on instructional preference and that environmental stimuli aspects are influential in their effect on learning. Sternbergôs second category ôteaching-styleô is focused more on one of the environmental effects involved in the learning process. This aspect will not be pursued further as it is not an intra-personal aspect of style.

Whilst Sternberg focuses more on developing a theory of 'thinking styles', his exploration of the the issue of cognitive styles and learning styles is left unclear for the reader. Therefore the introduction of 'teaching styles', almost as an afterthought, does not help with the understanding of style and the factors that can affect learning.

Riding and Rayner (1998), however, provide further examples of models in their categories listed above. The second category, 'orientation to study', includes a series of models that describe the ways that students can approach the task of studying. These range from the aspects of motivation and intention to learn (Biggs, 1978, 1985), to aspects of quality of learning via a 'deep' or 'surface' approach (Entwistle, 1979, Entwistle and Tait, 1994, Marton, Hounsell and Entwistle, 1997).

The third category, 'instructional preference' has been mentioned earlier with reference to Dunn et al. (1989) but also includes other models that consider the interaction of the learning environment and the interface with the learner (Price et al. 1976, 1977), including aspects of social interaction, (Grasha and Reichmann, 1975)

The fourth category, 'cognitive skills development' focuses on aspects such as perceptual modality, e.g. visual, verbal auditory and activity-based modality, (Reinert, 1976). Information storage and retrieval skills involving cognitive complexity and categorization skills, etc. (Letteri, 1980). The more recent work of Keefe and Monk (Keefe and Monk, 1986; and Keefe 1989, 1990) proposes that cognitive style acts as a controlling mechanism in the information processing aspect of learning. This particular category therefore appears to be more closely linked to cognitive style and the descriptions of areas covered earlier in the chapter.

In returning to the theme of 'stable constructs' used in the various instruments used for assessing learning style, it would appear that some of the studies lacked psychometric rigour and that the construct validity in some cases was unclear. It is also apparent that the more aspects, or constructs, are included within the assessment instruments of

learning style, the more there appear to be problems with the instrumentôs reliability. It would therefore seem that what could be potentially stable factors are clouded by less stable factors in the analysis of data.

Learning Strategies

It is possible to perceive the process of learning as a problem solving exercise. That is, as one is faced with learning something new it is necessary to adopt some kind of strategy in order to learn whatever has to be learnt. The process of developing strategies begins at birth and continually develops. As one encounters new problems the repertoire of strategies will tend to grow. Failure to develop new strategies during one's lifetime tends to lead to the experience of increasing levels of failure in many aspects of life, social, emotional and academic.

Strategies for learning used over time tend to become automatic, or semi-automatic, and become embedded as skills. Research into how individuals approach the task of studying identify factors within the task and the reason for carrying out the task as influencing the strategies used (Entwistle, 1981; Biggs, 1978). For example, Biggs and Collis (1982) citing some of their earlier research found that students instructed to remember facts adopted a rote learning strategy and appeared to "buy quantity of learning at the price of quality." (p.200). Quality of learning tends to be related to the level of processing that learners adopt at the time of learning (Craik and Tulving, 1975) and suggest that the 'deeper' material is encoded, and the more widespread its interconnections with the cognitive structure, the more securely it will be retained.

The strategies identified in Biggs and Collis' work include:

- Learning material for reproducing ï using memory
- Learning material for meaning ï using deeper level processing
- Learning material to be integrated in existing structure ï translating

The motivational aspects of learning, or wanting to learn, are also a significant influence in the approach to learning, or studying, and linking high performance with high levels of motivation (Entwistle and Wilson, 1977).

Learning strategies are built up over time in the form of a cognitive toolkit (Riding and Rayner, 1998) involving the 'skill' to recognize which 'tools' are going to help solve particular learning problems in particular situations. These 'skills', or strategies, include: 'attending to detail', 'identifying starting points', 'establishing and testing hypotheses', 'forward planning', systematic exploratory behaviour', 'reasoning and deducing', 'divergent thinking', (Weber, 1978, 1982). Other research cited by Riding and Rayner (1998) consider several aspects of learning strategy, but only those relevant to the research background to the instruments described in the next section are cited here.

The two aspects linked to learning strategies are those concerning 'learning process approach' and 'instructional preferences'. The Kolb (1984), and Honey and Mumford (1982) models are process orientated. These models focus particularly on the developmental nature of learning style. The 'instructional preferences' models focus more on the ways learners adapt their strategies according to the learning environment and situation.

Section summary

To sum up so far, it would appear that much of the research into cognitive and learning style has some similarities with the conceptual ideas that abound in personality research. In particular, there are strong indications that personality factors have some effect on how individuals are motivated to deal with learning tasks. Cognitive style appears to be related to the intrinsic control factors of information processing. It appears that style mediates between the external 'environmental' factors and the internal personality factors.

The 'environmental' aspects of the learning situation have an extrinsic effect on how learners learn. For example, the expected outcome of the learning process is affected by the reason for setting the task, whether it be an assessment task or an assignment, and also the conditions in which the task takes place.

The two contrasting models of categorization of styles, Sternberg, and Riding and Rayner, show that different models can view the same theories in different construct categories. Whereas Sternberg has based his work on developing a model of thinking styles as applicable to the way people behave in the workplace, particularly in management roles, Riding and Rayner have structured their analysis more from an educational viewpoint in helping to explain individual differences.

In order to rationalise and simplify the plethora of models of cognition and learning, there appear to be two higher order dimensions that combine the various constructs described. The two dimensions proposed describe how individuals see things as 'wholes' or 'parts' and whether they encapsulate (or code) concepts symbolically or in

images. Riding and Rayner (1998) have proposed the 'wholistï analyst' and 'verbaliserï imager' dimensions as a model of cognitive style that includes the major attributes associated with the other style models described.

A brief description of learning strategies has been included since it relates how approaches to learning, motivational aspects as well as environmental factors all play a part in the way individuals learn. The interaction of all these variables make for a complex situation for researchers studying cognitive and learning styles.

Learning Style Assessment

The research areas reviewed above have explored the field of cognitive style and learning style models each of which has used a specifically designed instrument for testing the model. Many of these instruments have been criticised for lacking psychometric rigour and conceptual clarity and this has added to the confusion and complexity described earlier.

A distillation of these model frameworks can be encompassed within a ówholistôï óanalyticô dimension, but the question arises, ówhat are the behavioural indicators?ô This has required further research to help refine the meaning of these constructs. In terms of types of cognitive style, the behavioural descriptors suggest that whilst some people focus on details, others look for the broader picture. However, it is possibly more likely that we do a bit of both depending on how our minds are directed, or on our previous experiences, or assisted to see a different point of view. Some individuals will need more help to see the detail whilst others will need help to see the bigger picture.

Why some individuals view things ówholisticallyô or óanalyticallyô is not clear from the current research. Why people have, or develop, these styles, or what makes individuals organize their experiences and memories in particular ways is a subject for more in-depth research into the natureï nurture debate and the field of cognitive psychology and neuroscience. New constructs will no doubt emerge in the future but what has happened so far?

The current research will use two instruments, one focusing on learning style the other on cognitive style. Their origins are based on theories and models described above but are brought together in what is proposed as a unifying model.

The first model to be described aims at examining some of the environmental factors and processes that affect studentsô learning, namely how material to be learned is delivered to, and acquired and processed by the learner. The model, devised by Kolb (1984) uses a theme of óexperiential learningô and brings together some of the different strands outlined in chapter 2 on theories of learning into a more coherent whole as follows:

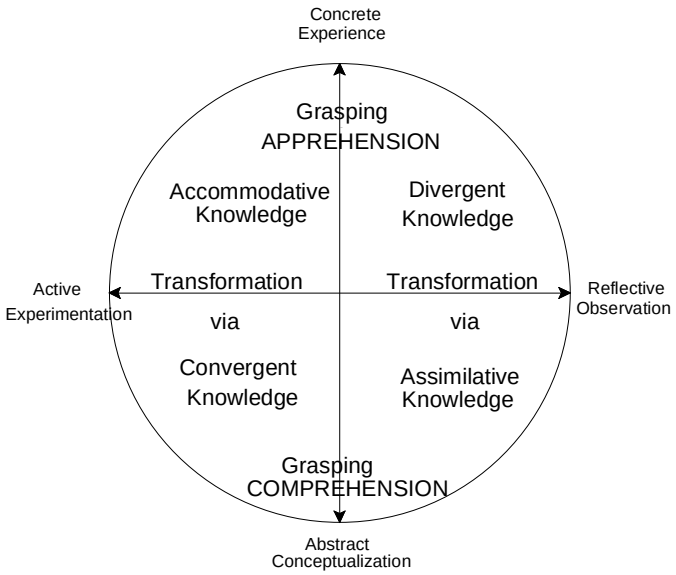

Figure 3:1 Kolb's model of Experiential Learning

In essence, the process of óapprehensionô is the receiving of concrete stimuli from our experiences from which order and structure are imposed in the process of ócomprehensionôï leading to óabstract conceptualizationô of these experiences. The receiving of information, through sensory perception, is initially random, depending

on what we focus on from moment to moment, and this results in divergent knowledge that becomes órawô food for thought ï óreflective observationô.

Through the process of comprehension, this information is internally transformed and becomes óassimilative knowledgeôand ready for transformation via extension, in which the abstract conceptualizations combine to become convergent knowledge. The convergent knowledge is then available for active experimentation and through further apprehension becomes accommodative knowledge. This cycle of processes in learning lead to the production of óbuilding blocks for developmentally higher levels of knowing.ôóThe simple perception of experience is not sufficient for learning; something must be done with it. Similarly, transformation alone cannot represent learning, for there must be something to be transformed, some state or experience that is being acted upon.ô(Kolb, op.cit.).

Craik and Lockhart (1972) view learning and remembering as dependent on levels of processing. Their theoretical framework involves a central control mechanism, the primary memory or attentional system, and they interpret learning entirely in terms of moving through ever deeper levels of processing. óMemoryôis considered as simply a by-product of thinking: that is, traces left behind by past information processing. (Schmeck, 1983). To some extent this view is closely linked to the example of ómental modelsô(Johnson-Laird, 1983) described above.

Earlier in this chapter the building blocks of the learning process have been considered, and one of the models, Kolb (1984), develops a theory of learning that takes a pragmatic view of the learning process. Kolb developed an instrument, The

Learning Styles Inventory (LSI) for analysing individual learning styles.

The Learning Styles Inventory (LSI)

Kolb developed his learning styles inventory to provide an instrument that could assess the learning styles proposed in his model; this is based on four main objectives:

> ñthe test should be constructed in such a way that people would respond to it in somewhat the same way as they would a learning situation; that is it should require one to resolve the opposing tensions between abstractï concrete and activeï reflective orientations.
>
> ña self-description format was chosen for the inventory, since the notion of possibility-processing structure relies heavily on conscious choice and decision.
>
> ñthe inventory was constructed with the hope that it would prove to be valid ï that the measures of learning styles would predict behaviour in a way that was consistent with the theory of experiential learning.
>
> ñThe test should be brief and straightforward, so that in addition to research uses, it could be used as a means of discussing the learning process with those tested and giving them feedback on their own learning styles.

The test itself is a nine item self-reporting questionnaire. Each item comprises four words which the individual respondent is required to rank order. The pattern of rank ordering the words provides an indication of their learning preference or style.

The results of the LSI indicate a personôs relative emphasis on each of the four modes in the learning process ï concrete experience (CE), reflective observation (RO), abstract conceptualization (AC) and active experimentation (AE) ï plus two combination scores that indicate the extent to which the person emphasises abstractness over concreteness (AC-CE) and the extent to which the person emphasises action over reflection (AE-RO).

Characteristics of the basic learning styles

Kolb develops ideas from his model by describing the characteristics that underpin the learning styles observed. He writes:

> ñOver time, individuals develop unique possibility-processing structures such that the dialectic tensions between the prehension and transformation dimensions are consistently resolved in a characteristic fashion.ò
>
> ñThrough socialization experiences in family, school and work, we come to resolve the conflicts between being active and reflective and between being immediate and analytical in characteristic ways, thus lending to reliance on one of the four basic forms of knowing:
>
> *divergence,* achieved by reliance on apprehension transformed by intention;
>
> *assimilation*, achieved by comprehension transformed by intention;
>
> *convergence*, achieved through extensive transformation of comprehension;
>
> *accommodation*, achieved through extensive transformation of apprehension.
>
> ñEach of us in a unique way develops a learning style that has some weak and some strong points. Evidence for the existence of such consistent unique learning styles can be found in the research of Kagan and Witkin (Kagan and Kogan, 1970). They find, in support of Piaget, that there is a general tendency to become more analytic and reflective with age, but that individual rankings within the population tested remain highly stable from early years to adulthood. Similar measures have been found for measures of introversion/extraversion.ò (Kolb, 1984, p.77)

Kolb then links aspects of personality traits to embrace the learning styles of individuals by using the Jungian based model of Myers (1978).

Kolb's application of Jung's Personality style and Learning style

Table 3.3 Jung's Psychological Types (Kolb, 1984 p.80)

Mode of relation to the world	E EXTROVERT TYPE Orientated toward external world of other people and things.	I INTROVERT TYPE Oriented toward inner world of ideas and feelings
Mode of decision making	J JUDGING TYPE Emphasis on order through reaching decision and resolving issues.	P PERCEIVING TYPE Emphasis on gathering information and obtaining as much data as possible.
Mode of perceiving	S SENSING TYPE Emphasis on sense perception, on facts, details, and concrete events.	N INTUITION TYPE Emphasis on possibilities, imagination, meaning and seeing things as a whole.
Mode of judging	T THINKING TYPE Emphasis on analysis, using logic and rationality.	F FEELING TYPE Emphasis on human values, establishing personal friendships, decisions made mainly on beliefs and likes.

Kolb's view of the Myers-Briggs Type Indicator (MBTI)

Some caution is urged (Kolb, 1984, p.80) on looking at the correlations between the MBTI and LSI for two reasons:

> ñboth the LSI and the MBTI instruments are based on self-analysis and report. Thus we are testing whether those who take the two tests agree with our predictions of the similarity between Jungôs concepts and those of the experiential learning theory; we are not testing, except by inference, their actual behaviour.
>
> ñit is not clear how adequately the MBTI reflects Jungôs theory. In particular, the items in the MBTI introversion/extraversion scale seem to be heavily weighted in favor of the American conception of the dimensionò i.e. extraversion as social and interpersonal ease, and introversion as shyness and social awkwardness.

Margerison and Lewis (1979) investigated the relations between the LSI and MBTI scores. They found a significant correlation of 0.45 ($p<.01$) between the two sets of scores.

The relationships between the Jungian types and the learning styles are shown in Figure 3.2 below. The sensing type is associated with the accommodation learning style, and the intuitive type falls in the assimilative quadrant; the feeling personality type is divergent in learning style, and thinking types are convergent. These findings support the predictions made by Kolb;

> ñthere is a correspondence between the Jungian concepts of introversion and the experiential learning mode of reflective observation via intentional transformation, and between extraversion and active experimentation via extension. In addition, concrete experience and the apprehension process are clearly associated with both the sensing approach to perception and the feeling approach to judging. Abstract conceptualization and the comprehension process, on the other hand are related to the intuition approach to perceiving and the thinking approach to judging.ò (Kolb, 1984, p.79)

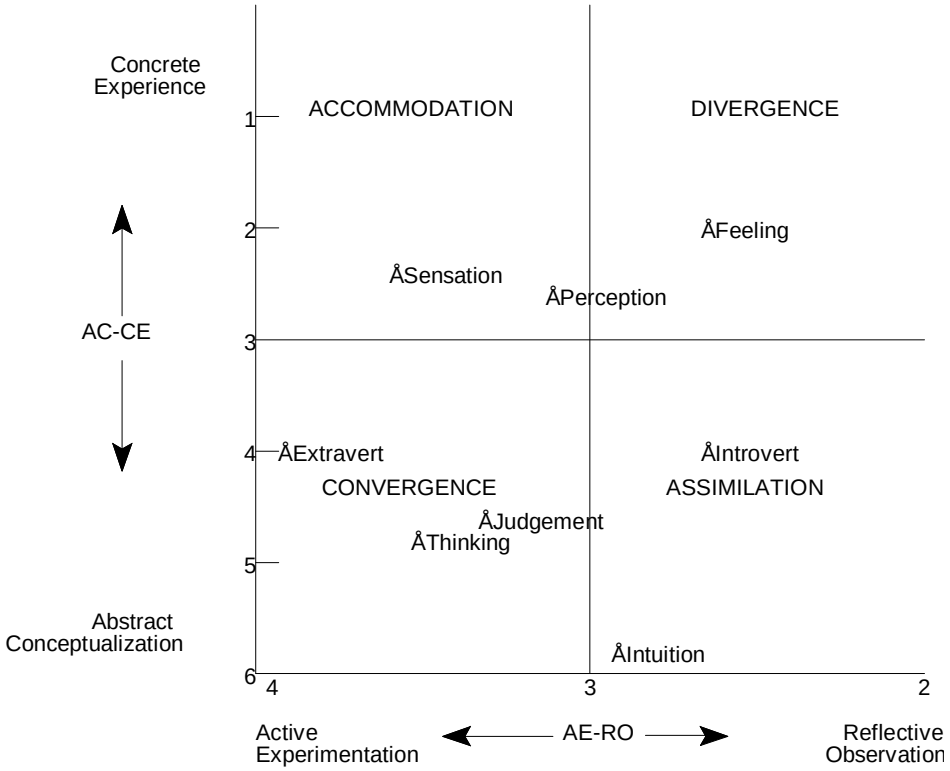

Figure 3.2 The relationships between the learning styles and the MBTI personality types.

Epistemological Theories

Kolb extends his thinking about learning style by considering how knowledge is created and recreated through learning from experience and the structure of knowledge. He compares the rationalist and empiricist philosophical views with the interactionist views. The former, i.e. the rationalist, view is that truth is discovered through logic and reason, whereas the empiricist sees knowledge and truth as an accumulation of sensory impressions but the mind makes no contribution of its own excepting recognition of the ósubstanceô of these impressions. The interactionist view is that the mind prepossesses a structural machinery that enables it to interpret experience and to understand order and uniformity. ôTruth in *critical idealism* (Kant) was the product of the interaction between the mindôs forms and the material facts of sense experience.ô

Kolb believes that these philosophies of knowledge development have limitation in the formation of a sound basis for a theory of experiential learning and proposes a ódual-knowledgeô approach. Though he tends towards a more interactionist philosophy he feels that the Piagetian view of interactionism is too rationalist in spirit by considering that sensations are only the starting point of knowing and that more emphasis is placed on the organization and transformation through which we construct reality. Kolb on the other hand believes that ócomprehensionô and ócomprehensionô should be given equal weight to come to a *transactionalist* view rather than an interactional one.

In describing this view he states, ñ..knowing by apprehension is here-and-now, ... continuously unfolding present movement ... wherein events are related via

synchronicity. Comprehension .... is by its very nature a record of the past that seeks to define the future; the concept of linear time is perhaps its most fundamental foundation, underlying all concept of causality.ò

The Experiential Learning Theory of Development

> ñThere is a quality of learning that cannot be ignored. It is assertive, forward-moving, and proactive. Learning is driven by curiosity about the here-and-now and anticipation of the future.ò (Kolb, op.cit. p.132).
>
> ñWithout denying the reality of biological maturation and developmental achievements, (that is, enduring cognitive structures that organize thought and action), the experiential learning theory of development focuses on the transaction between internal characteristics and external circumstances, between personal knowledge and social knowledge. it is the process of learning from experience that shapes and actualizes developmental potentialities. This learning is a social process; and thus, the course of individual development is shaped by the cultural system of social knowledge.ò (Kolb, op.cit p.133)
>
> ñThe way learning shapes the course of development can be described by the level of integrative complexity in the four learning modes ï affective complexity in concrete experience results in higher-order sentiments, perceptual complexity in reflective observation results in higher-order observations, symbolic complexity in abstract conceptualization results in higher-order concepts, and behavioural complexity in active experimentation results in higher-order actions.ò (p.140)

The 3D model describes a cone built on the circular 2D model (illustrated earlier). The cone shape represents the increasing integration at the higher stages of development. ñDevelopment on each dimension proceeds from a state of embeddedness, defensiveness, dependence, and reaction to (towards) a state of self-actualization, independence, proaction and self-direction.ò

Development is not seen to be linear, as in the Piagetian model, but dependent on external experiences as well as the internal transformation of previous experiences.

Development along the four complexity dimensions of the Kolb model may proceed at different rates but through three proposed stages:

Stage one ï Acquisition (birth to adolescence) ï development at this stage is marked by the gradual emergence of internalized structures that allow the child to gain a sense of self that is separate and distinct from the surrounding environment.

Stage two ï Specialization (late adolescence to early adulthood) ï at this stage the person achieves a sense of individuality through the acquisition of a specialized adaptive competence in dealing with demands of a chosen ócareerô.

Stage three ï Integration (adulthood) ï the person resolves the conflict between needs of self and needs of society in the drive for fulfilment, or óindividuationô as Jung describes it.

The table on the next page (Table 3:4) sets out Kolbôs Experiential Learning Theory of Development Levels of Adaptation and the Structure of Consciousness. (Kolb, D.A. (1984)

Table 3:4 Kolb's Experiential Learning Theory of Development Levels of Adaptation and the Structure of Consciousness

Developmental stage of maturation	Acquisition	Specialization	Integration
Level of Adaptation	Performance	Learning	Development
Structure of consciousness:	Registrative	Interpretative	Integrative
Extension in time	seconds, minutes, hours	days, weeks, months	years, decades, lifetimes
Extension in life space:	responses, acts, tasks	projects, jobs, occupations	careers, lives, generations
Feedback structure	Goal directed first-order feedback to achieve goals	Learning how to learn; 2nd-order feedback to change goals & strategies	Consciousness/integrity; 3rd-order feedback to link goals to life purpose
Hierarchic integration of learning modes:	Many differentiated structures with low integration between them	Fewer but larger specialized structures; high integration within structures; low integration between structures	Development of complementary specialized structures; high integration between structures
Concrete experienceï affective complexity via apprehension	Direct sensing and feeling To Continuity of sensation and feelingï emergence of enduring sentiments	Self-aware system of sentiments and values to Differentiating selfôs & othersôsentiments and values	Relativistic appreciation of value systems to Value commitment within relativism
Reflective observationï Perceptual complexity via intension	Attention to Watchingï development of contiguous images	Reflection; giving observations personal meaning to Creating alternative meaning and observation schemes	Relativistic appreciation of different meaning schemes & points of view to Intuition; choosing meaningful perspectives
Abstract conceptualizationï Symbolic complexity via comprehension	Recognizing; enactive thought To Object constancy; ñkonicòthought	Concrete symbolic operations to Formal hypothetico-deductive reasoning	Attaching concrete meanings to symbol systems to Finding and solving meaningful problems
Active experimentationï Behavioural complexity via extension	Responding to circumstance To Doing; short-range intentional acts toward goals	Achieving; development of clear goals and longer range to Risk taking; making goal & strategy tradeoffs	Experimental hypothesis testing; change goals & strategies based on results to Responsible action; accepting unknown emergent reality

Definitions of some of the terms used are given below:

intention (used to mean intent, purpose, meaning) the transformation of ideas through focusing on different characteristics/attributes of concrete experiences, internal reasoning and abstraction, (in Piagetian terms ï intellectual aspects of thought that transform ideas through internalized actions or systems of transformation.)

extension the transformation of ideas to form new ideas through action, (in Piagetian terms ï operative thought through behavioural actions that transform objects or state.)

In Jungian terms Kolb considers that ñthe transformation dimension is perhaps best described by the concepts of introversion (intension) and extraversion (extension).ò In this proposal he suggests that introverts tend to put the psychological processes linked to self and subjective thinking above objective reality.

The origins and derivation of the Learning Styles Questionnaire (LSQ)

The model of learning processes proposed by Kolb has been adapted for practical use in the commercial field to help with the assessment and development of managers to understand their own preferences for learning; particularly those who also have a training role. Peter Honey and Alan Mumford have adapted the Kolb model, entitled, ólthe learning cycleô, and used it as a basis for training managers in self-development and team development by looking at their strengths and weaknesses based on their learning styles. The assessment instrument developed for identifying ólearning styleô, the Learning Styles Questionnaire, is illustrated and described below.

The Learning Cycle model – Honey and Mumford

It is the pragmatic use of these various models of learning, highlighted above, that forms the basis of Peter Honey and Alan Mumfordôs work on ólearning styleô. Their work has focused particularly on training and training design for managers. The óLearning Styles Questionnaireô, published in 1982, was developed not only as an instrument for analysing the learning preferences of individuals, but also as a tool that managers could use for self development and developing an awareness of the learning

and development needs of others with whom they work.

Although the ôLearning Cycleô model was adapted from the Kolb model of experiential learning, it emphasises the authorsô belief that learning, in a wholistic sense, must involve all the stages in the cycle to be effective. Whereas the developmental models describe the stages of cognitive thought processes from child to adult, the ólearning cycleô model encapsulates a view of how learning, at any stage of development, takes place. The ólearning cycleô model, illustrated below, describes the learning process as having four principal stages, namely ï óhaving an experienceô óreviewing the experienceô ódrawing conclusions from the experienceô and óplanning the next stepsô. These stages are seen to be the key to effective learning and the authors suggest that over emphasis, or under emphasis, of any of these stages would lead to less effective learning.

In parallel with this model of learning, Honey and Mumford propose that individuals have different levels of preference for each of the learning stages and the LSQ instrument is designed to identify the levels of preference on the four learning style types ï óactivistô, óreflectorô, ótheoristô and ópragmatistô. For example, some individuals may prefer a great deal of active experience but dislike having time to reflect on the experiences, whilst others may react in quite the opposite way.

The four main styles are described in terms of how they prefer to learn:

Activists will learn best from activities where they can engross themselves in short here-and-now activities such as business games and competitive teamwork; they learn less from activities where a passive role is required,

e.g. listening to lectures, reading or they are required to listen to statements of theoretical explanation.

Reflectors learn best from activities where they are able to stand back from events and listen and observe; where they are asked to produce carefully considered analyses and reports; where they learn less from situations that require action without planning or there are worries about rime pressures or being rushed from one activity to another.

Theorists learn best from activities where what is being offered is part of a system, model, concept or theory; they learn less from unstructured activities where ambiguity and uncertainty are great; where they feel themselves out of tune with other participants.

Pragmatists learn best from activities where there is an obvious link between the subject-matter and the problem or opportunity on the job; they learn less well when the activity seems distant from reality

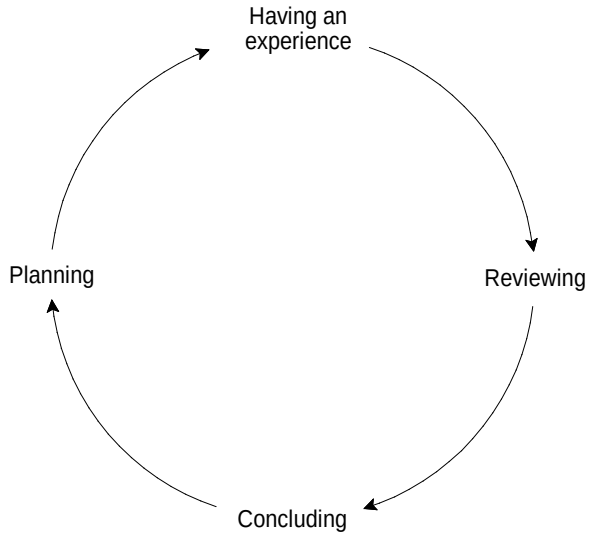

Figure 3:3 The Learning Cycle – Honey and Mumford (1982)

Examples of this model in action (Mumford, 1995) describe how some of the

management training techniques, e.g. business games and outdoor training, focus on the *having an experience* stage; whereas lectures and book learning are more closely aligned to delivering *conclusions* ï concepts, structure, models. The model that Honey and Mumford (1982) propose is in response to their belief that many training methods do not provide learning experiences that are balanced. There is frequently too much emphasis on *activity* without providing opportunities to *reflect* and *draw conclusions* from the learning experiences.

The LSQ instrument itself samples ópreferencesô for learning rather than the processes. It thus represents an instrument that samples the interface between the individual and the external 'environment', i.e. the outer layer of the 'onion model.

The Cognitive Styles Analysis

The Cognitive Styles Analysis (Riding, 1990) samples the processing activities that 'mediate' between the primary sources, (remembered knowledge, memory, personality sources, and gender) and the cognitive inputs form and outputs to the external world. In terms of the óonionô model this represents the middle layer activity where the external stimuli are coded for storing in memory.

The research background to this instrument has been discussed in the section on cognitive styles. Principally, the instrument assesses the degree to which an individual views things 'wholistically' or 'analytically' using a series of computer presented diagrams which the subject has to respond. The diagrams are in their nature similar to those in the Embedded Figures Test and require the subject to 'disembed' the figures to respond by pressing one of the keys on the computer keyboard.

The subject also has to respond to a series of verbally presented statements that require 'verbal' or 'imagery' processing in order to respond. The ratios of response times is calculated by the software to indicate to the subject whether they tend to be 'wholist' or 'analytic', 'verbaliser' or 'imager', or somewhere in between.

The CSA instrument has been designed in such a way that its method of data collection avoids many of the criticisms levelled at other instruments purporting to measure cognitive style.

Summary

In this chapter the background has covered a wide area of research in the fields of cognitive and learning style, and personality measures.

One of the main problem areas in this study has been the proliferation of construct labels and definitions used in the quoted research studies. It would appear that seeking stable anchoring points can only be gained through careful study of the research methodologies used to derive the constructs.

The many labels used for naming the constructs in measures of personality, cognitive and learning styles are examined in order to identify common factors amongst the instruments used in research studies. The problems of interpretation are inconclusive except where correlational studies have identified relationships between the factors.

The aspects of 'style' appear to be linked with the ómiddleô layer, which comprises the information processing aspects of cognitive functioning. The inner ólayerô of the 'onion' model comprising the neurophysiological and personality factors are deemed to be the most stable aspects, which are least susceptible to any influences to change them.

The efficiency of processing is influenced by both the neurological and personality factors as well as the external and perceptual factors and conditions; i.e. the inputs. However, the observable behaviours are in effect only the outward manifestations of the more inner processes and personality influences.

The various models of learning and thinking outlined in the previous chapter have

been brought together in the "experiential learning" model described by Kolb. This model attempts to look at learning as a continuously growing process involving interaction with the learning environment, reflecting on the observations, drawing conclusions and establishing concepts and principles followed by further action based on the new knowledge.

The Kolb model of learning was then adapted by Honey and Mumford in which they used the four aspects in the experiential learning cycle as a basis for their own model of learning styles. The Learning Styles Questionnaire (LSQ) was devised to assess the degree to which individuals tend to be "activeö learners, or "reflectorsö, "theoristsö or "pragmatistsö. In terms of the "onionö model this instrument assesses the outer layer of functioning.

In contrast to examining the surface aspects of learning styles, the "Cognitive Styles Analysisö (CSA) assesses style at a deeper level since it uses processing behaviour as its measure. The derivation of the instrument is based on the premise that an individualös cognitive processing time is relatively longer or shorter in a consistent way according to whether they are "wholistsö or "analystsö, "verbalisersö or "imagersö

In the next chapters the data collected from samples of Fire Service College students will be analysed in the hope that some further clarity will be gained about the nature of learning style, cognitive style and their relationships with preferences for methods of delivery.

CHAPTER 4

Research methodology

Overview

This chapter introduces the context in which the research study was carried out and the methods used to gather the data.

The research examines possible relationships between how students say they prefer to learn, i.e. their own learning style (as sampled by the Learning Styles Questionnaire (LSQ) ï Honey and Mumford) and their cognitive style (as sampled by the Cognitive Styles Analysis (CSA) ï Riding). The possible use of these instruments for matching training delivery systems to preferred styles will be considered in a later chapter.

The data gathered during this research was examined to see whether the instruments used could yield useful information about the factors and relationships that could be of use to future course designers when planning or redesigning courses at the College.

Research methodology

Research sample

In Chapter 1, details were given about the Fire Service College, its organization and the progression training programme structure. The sample chosen for the research study comprised students who were aspiring to take on more senior roles within the fire service and who would have responsibility within a brigade division, i.e. having a management function across a number of fire stations within a local authority brigade.

The particular students that formed the research sample were attending the Divisional Command course. There is no formal selection procedure for this course, unlike the Brigade Command Course, but they are recommended by the chief officer of their brigade as having the potential for a senior officer role. There are no other formal assessments as entry qualifications other than having successfully completed the earlier progression courses run by the College that were mentioned above. There is also no formal assessment at the end of the course other than that they have to produce a project report, the Management Study Project. A considerable amount of work is required to complete this project and students are invited to submit them for a City & Guilds Senior Awards to obtain either the Licentiate or Graduate qualifications; exceptional projects may be submitted for the Members level, but the more senior Brigade Command students are recommended to apply at this level. The Divisional Command students' projects are expected to qualify at least at Licentiate level. These projects are also externally examined by staff at Coventry University.

Research rationale

Before making any recommendations about changing and óoptimisingô training delivery systems (as described in Chapter 1), it was felt that some analysis of the existing course delivery practices should be carried out; and also to look at studentsô impressions of them. This information would then be of some assistance to future course design teams in helping them to select the way courses are presented to students.

In this study, there is an intention to analyse the learning styles and cognitive styles of students together with data about their preferences so that some evidence about course delivery could be considered when designing new courses.

During the last seven years, since joining the staff of the Fire Service College, only one study of students' learning style has been carried out. This earlier study of the ólearning stylesôof Fire Service College students (Shevels, 1996) identified some differences between the learning styles of junior officers as compared with those of more senior officers. This study used the *Learning Styles Questionnaire* (LSQ ï Honey and Mumford) as the main data gathering instrument. The findings suggested that more junior officers tended to be more óactivistôand therefore would tend to prefer a more active style of approach to learning as compared with their more senior officer colleagues, who appeared to be more interested in reflecting on the theory and practical application of what they were learning.

In this earlier research there was no other indicator as to what type of learning was favoured by these óactivistsô, or the more óreflectiveô, ópragmatistô senior officers other than by inference from the LSQ handbook.

This current research will use additional data to that used in the previous research in order to help inform those involved in designing future courses. The LSQ and CSA instruments will be used as measures of learning style and cognitive style processes respectively, together with a survey of current preferences for training delivery methods used on existing courses. The data gathered is used in an exploratory study to determine how far these instruments can be used as an indicator to help optimise the training of students by using their preferred ways of learning.

At present, a large amount of teaching delivery takes place in lecture rooms in much the same way as in other academic institutions. The general mode of information transfer is by óinteractive lectureô, which is predominantly teacher directed with a minimum of student-teacher interaction. Frequent use is made of the overhead projector on which the main points are listed, almost as a lesson plan or prompt. ó Death by a 1,000 overheadsô has been a frequent criticism and this is gradually being replaced by a computer generated equivalent.

The question that arose, and prompted the current research, was, "How effective are these methods of course delivery for fire officers?" A supplementary question was, "Do these methods suit all student officers?"

Within the timescale of this research it has been impossible to answer both these questions thoroughly. Access to the full range of students has not been possible due to the complexities of the training programme and the limited amounts of time during which students had access to computer facilities; and hence access to the CSA software.

The only students who consistently had the necessary access to computers as part of their course, and who also had course components on ópersonnel selectionô, were the Divisional Command Course (DCC) students. These students, as has been explained above, were at, or preparing for, relatively senior levels of command. Unfortunately, they do not therefore represent the much wider range of students attending College courses. Whether or not their general characteristics and preferences are representative of fire officers as a whole, can only be ascertained by a more extensive study.

In this research, the patterns of cognitive style of individual students at the Fire Service College will be examined, as sampled by the CSA instrument software. Following from this, it is proposed to look at how the varying types of cognitive style may, or may not, relate to students' different preferences for modes of teaching delivery and learning. A similar analysis, using the Learning Styles Questionnaire (Honey and Mumford) and the mode of delivery preferences is also conducted.

Research into the field of how people learn is very complex and much of it tends to focus on small areas of learning in order that the number of variables are reduced and

can be managed. Similarly, the relationships between cognitive style and ways of learning may not have a simple association since what has to be learned may in some ways be restricted by the ways in which it can be learned; such as the *'ways of knowing'* described by Bruner (1964), referred to earlier. For example the teaching of a particular topic may involve a number of concepts each of which involve different processes of learning. The learning process as a whole is probably greater than the sum of the individual parts, i.e. the whole learning experience is probably of greater value to the learner than the sum of individual learning episodes, which are sometimes the subject of research and probably focus on what can be more easily measured.

In conducting this research, this is the dilemma, whether to look at the situation ówholisticallyô or óanalyticallyô or both.

Previous surveys – Task Analyses

Apart from the current research, The results of some previous analysis work will help to build up a profile of the target population at the College. An analysis of the tasks and types of work done by fire service personnel has been carried out at the Fire Service College (Sudbury Report 1992) and also by the Emergency Fire Service Lead Body in its compilation of competence standards.

Some further information about fire service personnel, in particular students who had attended College Divisional Command courses over the previous 10 years, became available. In contrast to the Sudbury Report, which looked at the roles fulfilled by fire service officers, the new information that came to hand provided an analysis of the personnel who filled these roles. The instrument used to gather this information was the Myers-Briggs Type Indicator (1962). Information from this source provided a contrasting view of the target group going back a number of years. A parallel study of MBTI data and the instruments used in the current study was not possible since MBTI data ceased to be collected a year or two prior to this study.

An interesting link appeared to exist between what the MBTI assessed and what the CSA and LSQ measured in that Myers and Myers (1995, pp. 139ï 147) link their personality 'types' with learning styles. In linking the task analysis, referred to above, and personality types, many of the tasks identified in the task analysis require *sensory* inputs rather than *intuitive* inputs (in Myers-Briggs Type Indicator terms). In the fire service roles there also appears to be a high level of demand in processing and analysing large amounts of information when dealing with an incident.

The student MBTI data collected between 1980 and 1990 are illustrated in Table 1, which shows the distribution of Divisional Command Course (DCC) students attending the Fire Service College.

Table 1: MBTI percentage distribution

	< Sensing – Intuition >			
	ST Sensingï Thinking	**SF Sensing–Feeling**	**NF Intuition–Feeling**	**NT Intuition–Thinking**
IJ	**ISTJ** 67 23.6%	**ISFJ** 10 3.5%	**INFJ** 8 2.8%	**INTJ** 30 10.6%
IP	**ISTP** 17 5.9%	**ISFP** 4 1.4%	**INFP** 5 1.8%	**INTP** 17 5.9%
EP	**ESTP** 12 4.2%	**ESFP** 2 0.7%	**ENFP** 9 3.2%	**ENTP** 16 5.6%
EJ	**ESTJ** 51 18.0%	**ESFJ** 9 3.2%	**ENFJ** 3 1.1%	**ENTJ** 24 8.5%

Sample size = 284

I = Introvert	J = Judging	S = Sensing	N = Intuition
E = Extrovert	P = Perceiving	T = Thinking	F = Feeling

The distribution indicates a large proportion of fire service officers whose scores lie in the ï ï TJ areas of the MBTI analysis. Of these, a larger proportion lie in the ï STJ areas, i.e. they would tend to rely on their senses rather than their intuition; this would also seem to be congruent with the job roles. The distribution of ôintrovertsô and ôextrovertsô is fairly equally balanced with a couple of percentage points in favour of the ôintrovertsô.

Some of the type descriptors used in the Cognitive Styles Analysis also appear in the MBTI above. For example, some parallel instances are taken from the MBTI and the CSA manuals as illustrations:

Myers-Briggs Type Indicator	Cognitive Styles Analysis
Extroverted types ï relaxed, confident, outwardly directed, people of action, and more at home with people and things.	Wholist style ï socially informal and relaxed, tend to be extroverted, social, lively and outgoing, prefer to be with other people and enjoy group activity.
Introverted types ï reserved, inwardly directed, real world is the world of ideas and understanding, more at home in the world of ideas than in the world of people and things.	Analytic style ï socially restrained and formal, socially unaware, withdrawn and introverted, often keep thought private and not say what is felt very readily.
Feeling types ï contribute by their loyal support, regarded as good by society, thinking as others think believing them to be right.	Wholist-Verbaliser type ï caring and responsive to the needs of others, limitation of not being discerning and of being swayed to and fro by passing fashions, flexible and will be happy to fit in with the plans of others.

In another research example, Furnham, et al (1997) reports that the EPP óextrovertï introvertô dimension correlates negatively with the Myers-Briggs (MBTI) óextrovertï introvertô dimension ($r = ï 0.53$ $p<0.001$). Further more they both correlate positively with the óactivistô dimension of the LSQ ($r = 0.47$ $p<0.001$). Some of the data collected in the current research will be examined to see if there are any similar associations.

This poses a major question mentioned earlier, namely, ñAre the constructs used in these instruments identical, similar or dissimilar?" Concern is also expressed by Riding and Rayner (1999) that the proliferation of labels, which appear to overlap the areas of 'ability' and 'personality', have caused confusion and some criticism of

research into cognitive style and learning styles. The present research aims to add another piece of the picture into the jig-saw.

Data gathering : Instruments used

Learning Styles Questionnaire (Honey and Mumford)

The Learning Styles Questionnaire (1986 edition) has been in existence since 1982 and has been widely used in a variety of business contexts to identify individualsô learning styles. The questionnaire is based on theories developed from the action research model of Lewin (1946), the experiential learning cycle model of Kolb, Rubin and McIntyre (1974) and Kolbôs Learning Styles Inventory (1976, 1981).

The instrument is a binary forced-choice questionnaire comprising 80 statements to which subjects are asked to ôagreeô or ôdisagreeô with each statement as individual students perceive them to apply themselves. Each statement represents a behaviour or preference that belongs to, or is associated with, one of the four learning style types; ôactivistô, ôreflectorô, ôtheoristô and ôpragmatistô. The designation of type is not made explicit to the subject and the item types are randomly distributed. The subject places a tick in the box for each statement that applies (agrees), or a cross or no mark for those statements that do not apply (disagrees).

Scoring is a simple process of marking a pre-prepared form on which the number of each questionnaire statement is listed. The question number is assigned to one of four columns, representing each of the four learning types, thus making total scoring easier. The number of statements that apply in each type column are totalled to yield a score on each of the four learning styles. The scoring is therefore objective and

requires no specific training. The scores are then cross-referenced with the standardised scoring grid to yield a five-point rating of preference; óvery strongô, óstrongô, ómoderateô, ólowô, and óvery lowô. Scores can also be plotted on a four-point graph to produce a pictorial profile of strengths and weaknesses relating to the learning types.

The authors propose that the instrument can be used as a diagnostic tool for developing individuals and strengthening some of their weaker strategies for learning. However, some understanding of the principles underlying the instrument is required if used for counselling and making recommendations to subjects.

All students attending the Divisional Command Course are asked in their course joining instructions to complete the LSQ (Honey and Mumford) questionnaire prior to attendance. The returns were analysed before the course commenced and the results sent to the course tutors. Apart from being used in the current research, the data is principally used by the tutors to set up the course syndicate groupings. Data collected from eight recent cohorts of students has been used in this current research. *(A more comprehensive sample data of 15 cohorts is given in Appendix 2).*

Cognitive Styles Analysis (Riding)

The óCognitive Styles Analysisô (CSA) was developed at Birmingham Universityôs Centre for Assessment and Evaluation Research by Dr. R. Riding. This instrument was developed in 1992 and has been the subject of considerable research study with

organizations ï such as British Gas, British Telecom and others ï through funding from the Department of Employment and its successor.

The CSA instrument is computer (PC) presented and comprises two main sections; firstly a set of 48 questions that sample the verbalizer and imager processes, and secondly a set of 40 diagrammatic problems that sample wholistic and analytic processing. The response mode is made simply by pressing one of two designated keys on the keyboard to indicate True or False to each question.

The questions related to the verbal aspect on the verbalï imagery dimension are straightforward statements that sample a subjectôs capacity to recognize category similarity, or difference, between pairs of concepts. The statements are in the form, óX and Y are the same typeô to which the response is either true or false; indicated by pressing the appropriate key. The set of questions related the imager style are based primarily on whether a subject can visualize the colour similarity or difference between two named objects. The questions of this type are written in the form óX and Y are the same colour. Similarly the response is either true or false.

The simplicity of the questions is both its strong point and yet a weak point as perceived by the students that we gave the CSA to. The major strong point is that the CSA can be used with a wide age range of subjects and also that there are minimal problems in interpreting and comprehending the questions thus reducing ónoiseô related to aspects of comprehension not related to the specific aspects under test.

The set of problem questions designed to sample wholisticï analytic processing are

derived from patterns similar to those in the Group Embedded Figures test used for assessing field-dependent and field-independent abilities. The question problems sample a subjectôs ability to disembed a simple shape from a more complex design.

The CSA software analyses the response patterns and produces two ratio values, one the wholistï analytic dimension and the second for the verbalizerï imager dimension. According to the values the subject is allocated to one of nine main CSA types; Wholistï Intermediateï Analytic on the WA dimension, and Verbalizerï Bimodalï Imager on the VI dimension.

Comparison of the instruments

These two instruments function in very different ways. The LSQ scores depend on subjects responding to the statements on the day and how they were feeling about the statements. The results obtained from the questionnaire therefore sample the surface elements of conscious preferences. The processing required to respond to the questionnaire is self-questioning, ôDoes this statement apply to me?ô for each of the 80 questions.

Like many other similar questionnaires, it is possible that the response is influenced by oneôs mood, length of time to respond, and thoughts about ówhat does the statement mean by this?ô and ôhow does the data collector want me to respond to this statement?' The result therefore probably contains an element of how the subject, in some cases, wishes to be perceived rather than an objective measure their true learning preferences.

The CSA, on the other hand, is designed to sample more of the inner processing aspects of the mind (Riding and Cheema, 1991) rather than the surface and conscious aspects as sampled by the LSQ. Since the content of the questions in the CSA is not intellectually taxing, the majority of subjects would not have any difficulty in responding (Riding and Rayner, 1998).

This simplicity of the óverbaliserï imagerô questions was perceived as major weak point by the DCC students, who are relatively sophisticated test takers having had experience of other personality instruments, and this, in the students' view, detracted from the CSAôs face validity. The lack of óchallengeô appeared to affect some students in taking the instrument seriously. However, the ówholistï analyticô questions in the CSA instrument appeared to the DCC students more like some of the non-verbal items they had experienced during their selection process to join the fire service. So, in terms of face validity there was less scepticism.

Sufficient information was provided for students to be disabused on this matter by explaining that the subtlety of the instrument lay in the computer analysis of the responses without giving away details of the mechanics of how it functioned.

The CSA software (experimental version) stores the subjectôs responses in a data file, which can be read through a normal wordprocessor. The data can be examined for patterns of responding that indicate whether a subject has taken the test seriously or has responded erratically. For example, a consistent pattern of short response times together with a large number of incorrect responses were usually the result of fast

repeated key pressing. Sets of data that showed suspect response patterns were disregarded for the purposes of this research.

The interface design and format of the CSA instrument enables it to be used by adults, as well as by children from about the age of eight or nine. It was therefore found by the subjects in the sample to be easy to use.

Teaching and Learning Preferences Survey

The third aspect of data gathering for this research used a rating questionnaire. This was compiled specifically for this research and lists 14 commonly used delivery methods on the Collegeôs teaching programme. The focus of this data gathering is on studentsô preferred learning modes; this looks particularly at the ôacquisitionô of knowledge and experience. The practical exercises that take place on the Collegeôs fireground have not been included in this research since this aspect of training focuses on the ôapplicationô of knowledge and experience (expressive behaviours) and would therefore need to be the subject of a separate research study.

The questionnaire was derived from a small pilot study using repertory grid analysis, described below, and subjects were asked to indicate their preferences for each of the 14 delivery methods on a five-point scale (Strong dislike, Dislike, No particular preference, Moderate preference, Strong preference). At the same time they were also asked to indicate on a three-point scale how helpful each delivery method was for their own learning, (Very little help, Quite helpful, Very helpful).

Methodology

A pilot study using Repertory Grid analysis

The initial pilot study aimed at identifying the type of questionnaire content that could be used to gather data about studentsô preferences for acquiring knowledge and skills. The process involved a small number of Fire Service College students who were interviewed informally and asked to generate constructs related to various types of course delivery methods and how they felt that they were helpful to their learning. For this study a limited number of elements were included in the construct elicitation process and represented a sample of six teaching delivery modes used at the Fire Service College. The six elements used were as follows:

A. Lecture

B. Demonstration

C. Discussion

D. Practical/simulation

E. Video/multimedia

F. Study books

The response forms given to the students provided space for ten forced/random selection of elements, e.g., DEF, ACF, BDE, etc. Students were asked to provide a word or phrase that stated how one of the three elements was seen to be different from the other two. The word/phrase elicited was then written down in the column marked ó*single description*ô. Students were then asked to supply a word or phrase with an opposite meaning that could apply to the other two elements; this would

supply the opposite pole of the bipolar construct. Students were asked to repeat this process by eliciting constructs for the list of other groups of three elements. Respondees were asked to keep supplying words or phrases (as constructs) and to avoid repeating any of those previously chosen, until they felt that they could not think of any more. In the sample of students the number of constructs supplied seemed to dry up after about seven pairs had been elicited.

The second part of the activity required students to mark with a tick each of their elicited constructs to show which construct pole they thought to be more helpful for their learning.

Finally, they were asked to rank the elements on each bipolar construct, using the range 1ï 6 according to how well each element (delivery mode) tended towards each construct. The rating 1 was given to the element that was best described by the preferred (i.e. ticked) construct; rating 6 given to the least.

The data from the forms were entered into the CIRCUMGRIDS III software to attempt to identify factors that could explain individualôs preferences.

The constructs that emerged from the analysis fell into the following main categories:

Practical	–	**Mental**
physical		verbal
hands-on		non-practical
practical learning		no touching

Participative	–	**Passive**
interaction		no feedback
open		closed
reciprocal		single
activity		lethargy
free to act		follow correct procedure

Visual	–	**Non-visual**
understandable		incongruous
clear		vague

From the information gained in this pilot exercise, it was decided that a short questionnaire should be constructed that incorporated a larger number of training delivery methods that covered these constructs, i.e. the types of delivery modes. The fourteen selected items include aspects of learning and teaching delivery such as: verbal, still and motion visuals, practical activities, private study, discussion and didactic modes.

Although one cannot be certain that an individualôs conceptualising of each delivery type will be identical to anotherôs, certain assumptions had to be made. In the case of each of the delivery modes included on the response form, the following definitions were provided. These are based on the common usage within the Fire Service College.

Every session taught on the College programme is covered by a óDirecting Staff Briefô (known as a DSBrief). The definitions of the delivery modes included on the questionnaire are those used on the DSBrief and the responses given should therefore reflect this common usage. But, in this method of research data gathering, one cannot assume that responses are underpinned by identical conceptualisation of the delivery method as perceived by subjects in the research sample. The purpose of the DSBrief, which is for teaching staff use, is to provide a specification for each session and includes the following details:

1. *Title of the session,*
2. *Study area aim* (A general aim for a series of sessions on a particular study area)
3. *Topic Aim* (An aim for the particular topic area)
4. *Terminal Objective* (An operational objective as to what the student should be able to do at the end of the session).
5. *Enabling Objectives* (A series of ómilestoneô objectives to be achieved by the student during the session).
6. *Assessment* (A brief description of the assessment method used to assess studentsô achievements).

7. *Duration* (The length of the session, i.e. the number of timetable periods required).
8. *Method* (The predominant delivery mode(s) used during the session).
9. *Resources* (The AV equipment and reference sources, including course materials, required).
10. *Conduct of the Session* (A brief outline ólesson planô for the session).
11. *References* (Other support materials to be read or used in conjunction with the sessionôs teaching).

A more detailed definition of the delivery modes, as used on the Preferences Questionnaire, are given below to assist understanding:

Listening to the lecturer talking ï this includes the oral dissemination of information by the presenter/lecturer, but excludes questioning and answering, use of visual materials and other interactive methods. Communication is essentially one-way.

Looking at pictures/diagrams illustrating the concepts and principles to be learned ï this includes any non-moving illustrative material including mounted charts, overhead transparencies of diagrams and charts, or similar materials that are mainly non-text in nature.

Watching 35mm slides, whilst listening to a commentary ï a particular mode of delivery used within the College where a carousel of slides is activated by a tape containing an accompanying commentary; a predominantly visual and oral presentation.

Watching video or film ï a moving visual image presentation usually with an oral commentary.

Demonstration using equipment/floorplans ï this mode of delivery would include laboratory demonstrations of chemical reactions, using a floor-plan model of an incident to plan the tactics of an operation and demonstrations of breathing apparatus servicing and assembly.

Reading through course notes or books ï these would include College produced notes to accompany a session as well as textbooks on the relevant topic. Excluded are materials designed for independent learning, (see below).

Writing notes and exercises about the topic ï this would include any activity during a session that require a written response.

Discussion with a tutor ï this includes sessions, including óinteractiveô lectures, that involve some form of verbal interaction with a tutor, discussion groups and tutorials.

Discussion with colleagues ï this includes sessions that involve a large degree of interaction between fellow students, with or without the presence of a tutor, this would include syndicate groups.

Working on simulated exercises/case studies ï these activities, commonly known as ódesk-topô exercises or simulations, can be carried out by individuals alone or as a small syndicate group.

Role play exercises – these are frequently held as part of a ómedia responseô module but can include situations officers might find themselves involved with during their duties. Many of these exercises are held in a TV studio so that video debriefing can be undertaken. (see below).

Debriefing practical exercises using video – practical exercises, including role play, are videoed either in a TV studio or on a portable camcorder system, so that those taking part can see themselves in action and group discussions evaluate their performance.

Library study and researching information – these are opportunities for self-directed study as part of a project or an assignment.

Using learning materials for study purposes – these are materials designed for independent learning (e.g. distance learning) and require little, if any, external tutor support.

The questionnaires designed for the research were then distributed to DCC students with the initial instructions to complete them for a particular session; as though for an evaluation of the session. Unfortunately, because many of the sessions did not include some of the listed delivery methods, this led to problems when analysing the data due to some delivery elements being omitted. Later on in the data gathering process, the instructions on the questionnaire were modified requesting that responses should be made to each of the 14 teaching delivery items whether or not particular delivery

modes were used at the time of completion and thus to base their preferences on a wider range of personal experiences, including attendance at previous courses.

The general form for the final version of the questionnaire was essentially the same as the trial version, i.e. there was a five-point rating scale for ópreferencesô and a three-point scale for indicating how óhelpfulô the delivery mode was for their own learning. *(See Appendix 1)*

The data from each of the three instruments ï CSA, LSQ and Preferences Questionnaire ï were entered into spreadsheets for subsequent visual analysis. Some formulae were devised to summarize the data, as well as using some of the in-built statistical functions within the spreadsheet software. The data was also prepared for entry into the SPSS computer package for a correlational and factor analysis to be carried out.

The design and structure of the spreadsheets will be described below.

Spreadsheet design

Several spreadsheets were produced to provide data for analysis. Initially all the data from the LSQ questionnaires, the CSA ratio scores and the Preferences Questionnaire were all entered into a spreadsheet, one for each course cohort; e.g. DCC0196.XLS to DCC0297.XLS representing courses DCC 01/1996 to DCC 02/1998 ï usually there are four courses of this type each year. *(See Appendices 2 and 3)*

The data from each of these spreadsheets were copied into a composite sheet, DCCSACS2.XLS that was also copied on to a second sheet within the file. The two

sheets were sorted in different ways; the first was sorted by ascending order of WA ratio scores, the second sheet was sorted by VI scores in a similar manner. A number of parallel operations were then programmed into each of the sheets to produce means and standard deviations on each of the delivery preferences.

The ópreferenceô statistics were then grouped according to their factor groupings (identified in the factor analysis). The scores on the WA and VI dimensions were then sub-divided into four equal groups representing Hi-wholists, Moderate-wholists, Moderate-analysts and Hi-analysts. This was also done for the data on the óverbalï imageryô worksheet. From this arrangement it was possible to compare the preference scores with the WA and VI scores.

The second spreadsheet DCCLSQPQ.XLS used the same data set but was sorted on four worksheets within the file, each sheet being sorted (rank ordered by score) according to the LSQ dimensions ï ópragmatistô, óreflectorô, ótheoristô and ópragmatistô. Similar calculations were performed on this data so that preferences could be compared with LSQ data.

The group of spreadsheets PREFDAT1.XLS to PREFDAT3.XLS contained all the data from the Preference Questionnaires. Only the third of these was used for a final analysis of the data, the other two were developmental trials. In this spreadsheet, the ópreferenceô and óhelpfulnessô data was grouped according to both CSA type and LSQ type and was listed according to raw data and proportions.

In each of the spreadsheets, formulae were devised to provide descriptive statistics about the various data collected. The preference data was then summarized in spreadsheet DCCCSAC2.XLS. *(See Appendix 2)*

A further set of spreadsheets were compiled to analyse the CSA response time data.

The first group of spread sheets were used to organize the raw data from the CSA.DAT text (ASCII) files. This process involved a considerable amount of detailed checking to ensure that the correct data appeared in each column. Sheet CSASAMP1.XLS contained data from the first sample of FSC students. These students represented cohorts from several different courses other than the DCC, which was the main focus.

The data from second main sample were imported into CSASAMP2.XLS. This sheet contained a larger sample of data and was checked in the same way as CSASAMP1.XLS to ensure the integrity of the data. From this spreadsheet, a third one was produced, CSASAMP3.XLS, the only difference between this and its predecessor being that subjects that contained cells with missing data were removed from the sample.

The response time data in this latter spreadsheet was sorted and analysed by WA, VI ratio scores, and also LSQ scores. Calculations of means, standard deviations and correlations with factor groupings were also carried out. Due to the ultimate size of the spreadsheet, smaller versions, LSQTIME3.XLS to LSQTIME6.XLS, were created that represented data across a limited combination of scores, e.g. ‘activist’ by

WA and VI ratios. The summary of this data was collected in spreadsheet CSASAMPT.XLS. *(See Appendix 3)*

The final analysis method employed the SPSS software package into which the complete data set from the spreadsheet DCCSACS2.XLS was imported. This involved exporting the spreadsheet data as a text-file and ensuring the various columns of data coincided by identifying cells of zero data.

The following analyses were carried out using the SPSS:

1. A comparison of CSA and LSQ scores from the sample of DCC students at the FSC and a sample of HE students from another educational institution.

2. A *'Hierarchical Log Linear'* analysis of the data to assess levels of significance between the two sample groups FSC and Business Studies Students (BSS). The Hierarchical Log Linear function is a multiple Chi-square analysis used with non-parametric data.

3. Factor analysis (principal components) of the Preferences Questionnaire data. to identify simpler classifications for types of training delivery.

4. A factor analysis of the LSQ data to compare the present data set with previous research, which suggested that the LSQ model comprises two dimensions rather than four.

5. Analysis of variance between the factor preferences, the CSA and LSQ.

A thorough examination was carried out of the data contained in the spreadsheets and the SPSS analysis output, in order to explore any possible relationships or associations between cognitive and learning styles and delivery preferences. The findings will be described in the following chapters.

Summary

In this chapter the context of the research and the sample of subjects have been described.

The research sample was taken from groups of students who attended the Divisional Command Course (DCC), which is an intermediate level of command and the individuals attending will be prepared to take responsibility for a brigade ódivisionô, i.e. covering a number of fire stations.

The rational for the research was to examine three main factors; the ólearning styleô and ócognitive styleô of the students and to sample their 'preferences' for different kinds of delivery.

The methodology of the data gathering involved the administration of the Learning Styles Questionnaire (LSQ) devised by Honey and Mumford, the Cognitive Styles Analysis (CSA) developed by Riding. There is a description of the derivation of a specially devised questionnaire to sample studentsô preferences for various training delivery methods. Problems in gathering the data are also described.

Finally, there is an account of how the data gathered from these instruments were analysed using both the Statistical Package for the Social Sciences (SPSS) together with specially prepared spreadsheets.

The analysis of this data is covered in the chapters that follow.

CHAPTER 5

Analysis of CSA and LSQ scores

Overview

This chapter is in three main parts. The first part describes the distribution scores from administrations of the CSA (Cognitive Styles Analysis) collected from the sample of Fire Service College students. The second part describes the findings from the LSQ (Learning Styles Questionnaire) data. In this part there is also a report of a factor analysis of the LSQ data and how it relates to previous similar studies. The third part looks at both the CSA and LSQ data to examine patterns of similarity and differences that emerge.

In all three parts, data from other research sample groups are compared to examine any patterns of similarity between different vocational groups. These include a survey of business studies students at an institution of higher education, a sample of students in further education and a sample of primary school children. The different cognitive style profiles of the groups as measured by the CSA instrument are compared to discover what inferences can be made about designing optimal learning situations.

Analysis of the distribution of CSA scores

The FSC sample characteristics

This part of the research study is based on data collected from a sample of students attending the Divisional Command Course (DCC). The College receives four (occasionally five) cohorts of students each year for Divisional Command training course; each cohort contains between 20 and 30 students. The current sample of data from students attending the DCC between 1995 and 1997 represents six cohorts of attendees (163 students), though sample sizes in the analyses vary from this due to random items of data missing from one of the three data gathering instruments. This sample data forms the main basis of the research.

A broader sample of students attending courses at the Fire Service College was also examined (see Chapter 7) but this focuses on the response times to items in the CSA data. Parallel data from the two instruments (CSA and LSQ) was not available from many of the students in this broader sample since the LSQ was not distributed to them as part of their course. Therefore, only data from DCC subjects from this broader sample were used in the analysis described in this chapter. Also, only subjects that provided parallel sets of data from both the CSA and LSQ are examined. Subjects who did not supply complete data sets were eliminated from this part of the research.

Students attending the Divisional Command course, which is of eleven weeks duration, study a wide range of topics all pertaining to the role of a Divisional Commander.

The particular topics included on the course that are relevant to this research are:

- Personal development, Understanding people ï a series of socio-psychological topics,
- Personnel selection, personnel management and deployment, training management.

The introduction to the Cognitive Styles Analysis software takes place during a course module on ópersonal awarenessô, ópersonal developmentôand ópersonnel selectionô. Both the CSA and the LSQ are used as examples, amongst some others, of instruments that can be used by individuals for increasing their self-awareness and for analysing their own strengths and weaknesses particularly in the area of ólearning to learnôand in helping them to be aware of the learning processes and how they learn best.

The concept of cognitive style is introduced to the students as being a particular factor that can influence the way people learn. The constructs used in the CSA, ówholistô, óanalystôóverbaliserôand óimagerô, are introduced to the students as part of a debrief of their own results after they have completed the CSA and refer to the handbook that accompanies. A similar debriefing is also given of their LSQ scores earlier in the course; the results of the LSQ having already been used to arrange the syndicate groupings.

After collecting data from a couple of DCC student cohorts, it appeared that they showed an atypical distribution of scores. A set of data collected previously from a sample of business studies students at another higher education institution was used in

order to provide a comparison. One of the main purposes for comparing this data was to add to the growing body of CSA data from different vocational groups that had already been collected and reported elsewhere (Riding and Rayner, 1998, p.134). Thus it was possible to examine cognitive style profile patterns associated with the different groups.

Results

The DCC students, having completed the CSA, were asked to record their results on a specially designed form. The information to be recorded by the students included both their WA and VI ratios as well as an indication of their CSA group category linked with the scores. The forms were then collected and this information was then keyed into a specially constructed spreadsheet designed to include both the CSA and LSQ data in addition to the responses supplied later in the Preferences Questionnaire. The relationships with the Preferences Questionnaire are analysed later in this thesis, (see Chapter 6). A correlation analysis between the CSA and the LSQ is given in more detail later in this chapter.

One of the first areas of analysis to be carried out was designed to confirm the view, Riding and Cheema (1991), that the Wholistï Analytic and Verbaliserï Imager dimensions are to be seen as independent of each other. This two dimensional model of cognitive style attempts to rationalise and synthesise a wider range of constructs that have been used in this field of research, examples of which were described in Chapter 1.

The model that underpins the CSA proposes that the two dimensions exhibit a low correlation and are thus independent of each other. The findings of this current study do in fact confirm these other research studies using this instrument in that the correlation between the dimensions was found to be r = ï 0.04. The other research findings that produced similar correlations include; Riding and Sadler-Smith (1992), r = ï 0.05, 0.00, and 0.04; Douglas and Riding (1993), r = ï 0.07, Riding and Douglas (1993), r = ï 0.03; Riding and Wigley (1996), r = 0.04. It therefore appears from the current sample that there is little relationship between the two dimensions.

Early trends observed during the data gathering stage suggested that the FSC students conformed to a profile that was not typical of what might be a broader sample ónormalô distribution. The additional set of data, mentioned above, from another research sample has been used as a means of comparison. The second sample was taken from a group of HE Business Studies students. This group was generally younger and many of them were in the 18 to 30 year age range. The DCC students on the other hand were mainly in the 30 to 50 year age range. The distribution of both samples of students is shown in the table (Tables 5:1 and 5:2) below.

The Fire Service College students, and Business Studies Students, are tabulated within the nine-category CSA model as follows:

Table 5:1 The number, (and percentages in brackets) of the Fire Service College (DCC) samples of CSA types:

	Verbaliser	Bimodal	Imager	Totals
Analyst	30 (18.4%)	35 (21.4%)	43 (26.3%)	108 (68.5%)
Intermediate	15 (9.2%)	12 (7.4%)	13 (7.9%)	40 (22.6%)
Wholist	5 (3.1%)	7 (4.3%)	3 (1.8%)	15 (9.0%)
Totals	50 (30.7%)	54 (33.1%)	59 (36.2%)	163 (100.0%)

The mean and SD: *WA mean = 54.3 SD = 39.3*
VI mean = 54.3 SD = 3.68

Table 5:2 The number, (and percentages in brackets) of the Business Studies students samples of CSA types:

	Verbaliser	Bimodal	Imager	Totals
Analyst	27 (37.5%)	26 (10.6%)	32 (13.1%)	85 (34.7%)
Intermediate	24 (9.8%)	27 (11.0%)	34 (13.9%)	85 (34.7%)
Wholist	21 (8.6%)	22 (8.9%)	32 (13.1%)	75 (30.6%)
Totals	72 (29.4%)	75 (30.6%)	98 (40.0%)	245 (100.0%)

The mean and SD: *WA mean = 81.6 SD = 4.71*
VI mean = 81.6 SD = 11.6

It was found that the distribution of Fire Service College students was heavily biased towards the óanalyticô end of the ówholistï analyticô dimension (68.5%). The ówholistô end of the dimension is very lightly represented (9%) and the óintermediateô range represents just over a fifth of the sample (22.6%). The WA SD = 39.3 indicates a much higher degree of variation in comparison with the VI dimension (SD = 3.68). The business studies students (BSS), by contrast, show a much more even distribution across the Wholistï Analyst dimension; there being about a third of the sample in each of the WAï groups. In this sample the WA SD = 4.71 and the VI SD = 11.6.

The distribution along the Verbaliserï Imager dimension for the Fire Service College students shows an almost even proportion in each of the three VIï types. The BSS students sample showed a slightly higher proportion in the Imager group in the VI dimension as compared with the FSC students.

A further comparison of Fire Service College students and Business Studies students, shows a large difference of profile across the ówholistï analyticô dimension between the two groups. A chi-square test of the data from the FSC students produced a highly significant result ($\chi^2 = 91.847$) when compared with a normally expected distribution. A multiple chi-squared analysis (using the SPSS Hi-Log Linear facility) of the combined data from the two samples also indicated differences between the two groups that were highly statistically significant ($p<0.001$) on the ówholistï analyticô dimension. However, across the óverbalï imagerô dimension the both student samples were more equally distributed and the differences were not statistically significant.

A similar comparison with three other research samples is examined below, (see Table 5.4).

Scores on both the ówholistï analyticô and óverbaliserï imagerô dimensions form two continua. A comparison was possible using data available in similar formats for both FSC students and of College of Further Education students (Riding & Wigley 1997).

The table of mean ratios is shown below (Table 5:3).

Table 5:3 A comparison of means and SDs of two samples groups

	FSC students			Coll. of HE students	
	Mean	**SD**		**Mean**	**SD**
Wholist/Analytic	1.68	0.62		1.28	0.47
Verbal/Imager	1.06	0.14		1.08	0.17

Cut-off scores between each of the CSA types have been standardised over a number of groups both in educational institutions and a number of vocational groups. From the data gathered, the boundary scores used in the CSA software are set as follows:

- On the ówholistï analyticô dimension the scores marking the boundaries between ówholistsô and óintermediatesô is 0.936ï 0.937 and for óintermediatesô and óanalystsô at 1.325ï 1.326.

From Table 5:3 it can be seen that the mean ratio score for FSC students (1.68) falls well within the óanalyticô range (i.e. >1.326), whereas one would perhaps expect the mean to fall within the óintermediateô range (i.e. between 0.937 and 1.325); as it does indeed for the BSS sample (1.28).

- On the óverbaliserï imagerô dimension the boundary scores for óverbalisersï bimodalsô are 0.985ï 0.986 and óbimodalsï imagersô 1.105ï 1.106.

The two sample means in this case both lie within óbimodalô range (i.e. between 0.986 and 1.105) and therefore on this dimension it can be inferred that both groups are reasonably ónormallyô distributed in relation to the population as a whole, or at least on the population providing the standardising data.

In order to confirm the finding that FSC students were atypical of other groups, as assessed by the CSA, further comparisons of data from other research samples were examined. Three other research studies were studied. They were: Riding and Sadler-Smith (1992), which sampled 14 to 19 year old students; Douglas and Riding (1993), which sampled 10 to 11 year-old children; and Riding and Wigley (1997), which studied 16 to 18 year-old FE students.

In each of these studies the subjects were allocated to sub-groups in numerically equal groupings to assist with analysis, rather than by cognitive style type using the standard cut-off ratios. It is therefore possible to observe the difference in score ranges *(the means are shown in parentheses where available)* for each of the groupings.

Table 5:4 The score ranges of research sample groups divided into two/three equal groups

CSA (score range) CSA type (percentile range)	FSC students	Riding & Wigley (1997)	Douglas and Riding (1993)	Riding and Sadler-Smith (1992)	CSA standard cut-off scores
Whol. (1.0ï 33.3)	0.50ï 1.35 (Mean = 1.11)	0.31ï 1.00	0.371ï 0.935	0.36ï 0.99	<0.36ï 0.936
Interm. (33.4ï 66.6)	1.36ï 1.76 (Mean = 1.57)	1.01ï 1.38	0.938ï 1.166	ï	0.937ï 1.35
Analyst (66.7ï 100)	1.77ï 4.02 (Mean = 2.32)	1.39ï 3.49	1.167ï 2.619	1.00ï 3.32	1.36ï >2.5
Mean WA	(1.68)	(1.28)	(1.08)	(1.06)	
Verbal. (1.0ï 33.3)	0.76ï 0.99 (Mean = 0.91)	0.40ï 0.99	0.830ï 1.049	0.78ï 1.02	<0.630ï 0.985
Bimod. (33.4ï 66.6)	1.00ï 1.11 (Mean = 1.05)	1.00ï 1.13	ï	ï	0.986ï 1.109
Imager (66.7ï 100)	1.12ï 1.52 (Mean = 1.21)	1.14ï 1.57	1.050ï 1.794	1.03ï 1.48	1.110ï >1.50
Mean VI	(1.06)	(1.08)	(1.09)	(1.04)	

A comparison of the score ranges of these equalised groups shows that whilst the research samples reported in 1992, 1993 and 1997 display a greater similarity with the standardised ranges, the data from Fire Service College students display a greater shift towards the analytic pole of the WA dimension. Whereas, on the Verbaliserï Imager dimension, there appears to be a greater conformity both with the standardised ranges and the other research samples.

Three of the research studies were samples from younger age groups. Thus, one might possibly hypothesise that as one becomes older individuals may become more analytic. However, a similar comparison of WA scores with age from the FSC studentsô data, it was not possible to confirm this hypothesis. Within the broad range sample of FSC students, their ages ranging from 18 ï 53 years, the correlations with age were as follows (Table 5:5):

Table 5:5 Correlations between Age, WA and VI scores of FSC students

	Age / WA ratio				Age / VI ratio		
	N=	**Mean age (SD)**	**Correlation**		**N=**	**Mean age (SD)**	**Correlation**
W/A	180	39.8 (7.74)	0.160	**V/I**	177	40.1 (7.78)	0.023

Data from Spreadsheet CSASAMPT.XLS

The age range represented in the sample was 18 ï 53 years. On both CSA dimensions the correlations were low and did not reach an acceptable level of significance. Therefore, on this evidence, the null-hypothesis is not rejected ï ôthere is no relationship between age and cognitive styleô.

Distribution and analysis of LSQ scores

Distribution of scores

Details about the derivation of the Learning Styles Questionnaire (LSQ) by P. Honey and A. Mumford have been given above. The instrument is reported to have been used widely in the management training field to facilitate self-awareness of oneôs strengths and weaknesses in the learning and development processes (Harrison 1988, p.75).

In the current research study, each student selected for the Divisional Command course was sent a copy of the ôLearning Styles Questionnaireô (Honey & Mumford) with their course joining instructions. Students were asked to return the questionnaire for analysis at the College two weeks before the course commenced. The Learning Styles Questionnaire response sheets collected from incoming cohorts of students were analysed using a specially prepared spreadsheet and the results were then given to the course director so that balanced syndicate groups could be arranged before the start of the course.

The mean scores for each of the DCC cohorts are as follows:

Table 5.6 Mean LSQ scores for the DCC student cohorts in the sample (SDs in brackets)

Cohort	Activist	Reflector	Theorist	Pragmatist
DCC01/96	7.86 (3.83)	14.86 (2.66)	13.95 (2.68)	13.76 (3.28)
DCC02/96	7.29 (2.86)	13.90 (3.01)	12.29 (3.53)	12.90 (2.99)
DCC03/96	8.82 (3.94)	13.55 (3.26)	12.27 (2.68)	13.23 (3.86)
DCC04/96	7.88 (3.30)	13.96 (3.23)	12.50 (2.55)	13.31 (2.81)
DCC01/97	8.71 (2.86)	13.10 (4.10)	12.00 (2.39)	13.57 (2.95)
DCC02/97	8.90 (3.90)	12.95 (3.58)	12.30 (3.20)	12.90 (2.79)
DCC03/97	7.33 (2.47)	14.33 (3.62)	12.83 (3.08)	13.44 (2.54)
DCC04/97	7.54 (3.82)	13.13 (3.52)	12.96 (2.17)	13.08 (2.96)

Overall, the profile of the course groups does not appear to change from cohort to cohort although the standard deviations indicate that some individuals within the cohorts can show some extreme scores on some of the dimensions.

The distribution of the total sample of FSC (DCC) students is shown as follows:

Table 5:7 DCC sample number and percentages (in brackets) of LSQ scores:

LSQ type	Activist	Reflector	Theorist	Pragmatist
Very strong	15 (9.3%)	19 (11.8%)	26 (16.1%)	26 (16.1%)
Strong	22 (13.7%)	**57** (35.4%)	35 (21.7%)	41 (25.5%)
Moderate	**67** (41.6%)	48 (29.8%)	**61** (37.9%)	**53** (32.9%)
Low	44 (27.3%)	22 (13.7%)	33 (20.5%)	31 (19.3%)
Very low	13 (8.1%)	15 (9.3%)	6 (3.7%)	10 (6.2%)

Sample size = 161 *(Predominant score range for each type shown in bold)*

Data collected from a previous study of Business Studies students is also included in the table below (Table 5:8) in order that a comparison of the distribution profiles can be made. The Strong ï Very Strong, and Low ï Very Low categories have been concatenated to enable comparisons to be made more uniformly and to show their proportions.

Table 5:8 Comparison of fire service officers with business studies students (in percentages)

LSQ type		Activist	Reflector	Theorist	Pragmatist
Strong/Very strong	**FSC**	23%	47%	38%	42%
	BSS	44%	52%	35%	24%
Moderate	**FSC**	42%	30%	38%	33%
	BSS	39%	28%	33%	38%
Low/Very low	**FSC**	35%	23%	24%	26%
	BSS	17%	20%	35%	38%

An examination of the proportions of students in each of the LSQ dimensions reveals the following findings:

Activist: The Business Studies students tend to be more activist than Fire Service Officers. Almost double the proportion of BSS was found to be óstrongô or óvery strongô activists as compared with the FSC students. Whereas more than FSC students were more than twice as likely to be ólowô or óvery lowô activists as compared with the BSS students.

Reflector: On this dimension the FSC and BSS students were distributed in a similar pattern. This showed that both samples of students tended to be óstrongô or óvery strongô reflectors.

Theorist: The BSS students were evenly distributed on this dimension from the óvery strongô to the óvery lowô. The FSC students were slightly more likely to be in the óvery strong/strongô or ómoderateô range but a lower proportion w*ere seen to be 'low/very low'.*

Pragmatist: The FSC students were much more likely to be óstrong/very strongô on this dimension than the BSS students who were more likely to be ómoderateô or low/very lowô.

An earlier study on Fire Service officers, Shevels (1996), indicated that there was a difference in the LSQ profile between junior and senior officers. A comparison of means from the 1996 study and the current study is shown in Table 5:9 below.

Table 5:9 Comparison of LSQ means, (SDs in parentheses)

	Shevels (1996)		**Current sample**
LSQ type	**Junior Officer**	**Senior Officer**	**DCC** (Senior Officer)
Activist	9.50 (3.36)	8.49 (3.31)	7.98 (3.30)
Reflector	13.84 (3.43)	13.62 (3.45)	13.93 (3.48)
Theorist	11.86 (2.81)	13.63 (3.03)	12.62 (2.96)
Pragmatist	12.54 (2.67)	14.28 (2.60)	13.52 (2.97)
Sample sizes	202	226	161

In the Shevels (1996) samples the mean score differences on the óactivistô dimension are reported to be significant ($p<0.002$). His findings support a view that the more Junior Officers have a more óactivistô learning style as compared with the more Senior Officers, who tended to be more ótheoristô and ópragmaticô in style. Since junior

officers were not included in the current research sample, no similar comparisons could be made.

The only further comment on these two sets of data would be to say that, in the current research (1997) sample, there appears to be an even greater difference on the ôactivistô dimension between the senior officers and the junior officers in the 1996 sample. On the ôreflectorô dimension there is little difference between junior and senior officersô mean scores from both samples. On the ôtheoristô and ôpragmatistô dimensions the differences between the current (1997) research and the junior officerï senior officer (1996) samples appear to be smaller.

From a learning styles point of view, and hence a pointer to those designing courses, there does appear to be some difference in learning style profile between junior and senior officers but only that senior officers are less ôactivistô. From a practical point of view, that would seem to suggest that the more senior officers would be less likely to depend on direct experience when learning than would more junior officers. This would seem to be in accordance with general developmental learning processes as outlined in the models by Piaget and Bruner. Older individuals have a longer, and possibly more varied, experience on which to build new learning than do younger learners.

Factor analysis of the LSQ Data

The Learning Styles Questionnaire ï LSQ ï (Honey and Mumford, 1982, 1992) is reported to have four dimensions, óactivistô, óreflectorô, ótheoristôand ópragmatistô. However, further factor analytical studies report that the data can be explained by fewer simpler factors, or clusters. This has brought into question the number of dimensions that can explain variations in sample data and has led to proposals that learning style can be explained in terms of two dimensions, óactionôand óanalysisô, (Allinson and Hayes 1988, 1990; Sadler-Smith and Riding ï 1997). Furnham, (1995) goes on to report that the personality trait óextraversionô(Eysenck and Eysenck EPQ 1975) correlates with the óactivistôlearning style. In his later research, Furnham *et al* (1997) reports correlations of LSQ factors with EPP factors and superfactors. He reports that the óactivistôand ópragmatistôdimensions correlate with (EPP) óextraversionôr = 0.47 and r = 0.29 respectively. On the other superfactors, óreflectorsôcorrelate with óneuroticismï stabilityôr = 0.17; óactivistôis significantly correlated with óhigh psychoticismôr = 0.46; óreflectorsôand ótheoristsôcorrelate negatively with óhigh psychoticismô, r = ï 0.38 and r = ï 0.25 respectively.

A recent research study by Shevels (1996) carried out at the Fire Service College used a cluster analysis technique to identify learning types amongst both junior and senior officers. His findings included three main clusters as follows: *Cluster 1* ï individuals having strong óactivistô, low óreflectorôand ótheoristôand a moderate ópragmatistô style; *Cluster 2* ï individuals with strong óreflectorô, ótheoristôand ópragmatistôwith a

moderate ôactivistô style; *Cluster 3* ï individuals with moderate ôactivistô, ôreflectorô and ôtheoristô with low ôpragmatistô style.

In view of the range of behavioural descriptors used within each of these clusters, it would be difficult to suggest stable constructs for each of the three clusters. This research highlights the complexity of identifying clear and discrete descriptors of learning style constructs.

In the current study, the data collected from the sample of Divisional Command students (N=152 providing complete parallel data sets) was added to the data from the Business Studies HE students (N=208). The total sample (N=360) was subjected to factor analysis using the SPSS package.

The pattern of correlations between the LSQ dimensions is shown in the following Table 5:10.

Table 5:10 Correlations between the LSQ dimensions

Correlations	Activist	Reflector	Theorist	Pragmatist
Activist	1.000	ï 0.446***	ï 0.391***	0.046
Reflector	ï 0.446***	1.000	0.535***	0.076
Theorist	ï 0.391***	0.535***	1.000	0.402***
Pragmatist	0.046	0.076	0.402***	1.000

2ï tailed significance: ** < 0.01 *** < 0.001

There are highly significant ($p<0.001$) negative correlations between ôreflectorsô, ôtheoristsô and ôactivistsô. There were significant positive correlations between ôtheoristsô and ôreflectorsô, and ôtheoristsô and ôpragmatistsô.

A principal components analysis on the current data did indeed yield only two factors with eigenvalues >1.0 (Factor 1 = 1.998, Factor 2 = 1.111). A Varimax rotation of the data clarified the correlational pattern and the resulting matrix is listed in the table below (Table 5:11).

Table 5:11 Correlation data on the LSQ Factor Analysis

	Factor 1	Factor 2
Activist	ï 0.836	0.127
Reflector	0.823	0.155
Theorist	0.649	0.609
Pragmatist	ï 0.052	0.946

Factor 1 accounted for 50% of the variance, whilst factor 2 accounted for 27.8% and thus the two factors contributed some 77.7% of the variance. The highest correlation on Factor 1 was the órefectorô; and on Factor 2 the ópragmatistô dimension loaded most highly. It is interesting to note that the ótheoristô dimension loads almost equally on both factors (0.65 and 0.61 respectively).

These findings, though suggesting that there are two factors, do not follow the Allinson and Hayes (1988, 1990) research.

In the process of conceptualising Factor 1 it is necessary to look at the items (statements) in the LSQ that are scored as órefectorô items, and also to a lesser extent those scored as ótheoristô items. The óactivistô dimension correlates highly negatively on factor 1 and a low positive loading on factor 2.

In order to attach some meaning to these factors, relevant descriptors from the LSQ are identified below. The descriptors for Factor 1 include sample statements such as:

Reflectors

7. ... time for thorough preparation and implementation.
13. ... take pride in doing a thorough job.
15. ... take care over the interpretation of data ...
16. ... reach a decision carefully after weighing up alternatives.
25. ... pay meticulous attention to detail before coming to a conclusion.
41. ... decisions based on a thorough analysis .... are sounder than those based on intuition.
66. ... think carefully before taking action.
76. ... always interested to find out what people think.

Theorists

3. ... tend to solve problems using a step-by-step approach.
12. ... keen on self-discipline ....sticking to a fixed routine.
14. ... get on best with logical, analytical people ....
18. ... prefer to fit things into a coherent pattern.
20. ... relate my actions to a general principle
47. ... can often see inconsistencies and weaknesses in other peopleôs arguments.
51. ... believe that rational, logical thinking should win the day.
63. ... like to be able to relate current actions to a longer-term bigger picture.

An examination of the constructs used in the above statements, and other similar statements in the same categories of the LSQ but not quoted above, show that the words *careful, thorough, meticulous, analytical, logical, relate to general principle, coherent pattern* and a *'need to gather information'* would typify people who are óanalyticalô in terms of their cognitive style.

These findings would tend to give partial support to the Allinson and Hayes (1988) research in that the factor they term *'analysis'* is one of the two main factors sampled by the LSQ.

Factor 2 appears to be founded primarily on the ópragmatistô category of the LSQ with a high loading of 0.95 and supported by a contributory element covered by the ótheoristô category (0.61).

The constructs that describe the characteristics of this factor can be gained from a representative sample of statements in the following:

Pragmatist

5. ... have a reputation for saying what I think, simply and directly.
9. What matters most is whether something works in practice.
19. ... accept and stick to laid down procedures .... so long as I regard them as an efficient way of getting the job done.
21. In discussions I like to get straight to the point.
35. ... tend to be attracted to techniques such as network analysis etc. ....
49. ... can often see better, more practical ways to get things done.
53. I like people who approach things realistically rather than theoretically.
73. I do whatever is expedient to get the job done.

The overriding characteristic of the Pragmatist is a person who is practical and wants to get things done.

It is perhaps puzzling that the descriptor statements in the LSQ óactivistô dimension do not load more highly on factor two, which tends to be óactionô orientated. There appears, therefore, to be a possible qualitative difference in the óactionô construct as indicated in the Allinson ï Hayes (1990) research as compared with the current research.

It could be argued that both óactivistô and ópragmatistô are action orientated as judged by their construct make-up illustrated by the descriptors listed above. Allinson and Hayesô findings suggest that the óactionô dimension correlates more with the LSQ

ôactivistô (r = 0.81 to 0.86) rather than has been found in the current research, which suggests that the ôpragmatistô descriptors form the basis of the ôactionô component.

In the later Allinson and Hayes (1990) research, which looked at the validity of the LSQ used with managers from Britain and Asia, the ôactionô dimension correlated with LSQ ôactivistô (r = 0.81 British sample, and r = 0.85 Asian sample); as compared with the correlation with ôpragmatistô (r = 0.15 British and r = 0.21 Asian). These findings are to be compared with the current research findings in which Factor 2 (action orientated) correlates with ôpragmatistsô (r = 0.95), and ôactivistô correlates to a much lesser degree, (r = 0.13). These findings may be the result of the smaller numbers in the FSC sample scoring Strong or Very Strong on the ôactivistô dimension

In attempting to lay some benchmarks as to what characterizes an activist learner, one needs to consider whether a person who has an ôactionôtype learning style exhibits the characteristics of an ôimpulsiveô, ôgo-gettingô learner, high on the psychotic scale or whether as a more ôrationalô, ôdown-to-earthô, practically orientated person who is low on the psychotic scale.

From the descriptors of the ôactivistô, it would appear that such people would tend to want to act without any constraints either in terms of procedures or out of consideration for the feelings of other people, and yet they to act on their own ôgutô feelings (intuition). There is an element of *impulsivity* in the statements relating to the ôactivistô whereas the actions of the ôpragmatistô are taken either after following procedures, or of knowing what works, or is practically feasible.

In attempting to define factor 1, it could be said that a bi-polar construct based on ôreflectivity ï impulsivityô would fit. This dimension would appear to be not only lexically similar to the Eysenck trait ôimpulsiveô in the ôpsychoticismô factor (3ï factor model), but also a trait in the ôneuroticismô factor of Costa and McRaeôs 5ï factor model. The range of descriptors in the LSQ that could be used to describe this factor would match the ôimpulsiveï controlô personality trait that is linked to ôregulatedô versus ôunregulatedô behaviour.

A factorial study of the EPP, LSQ and MBTI (Furnham, Jackson, Forde & Cotter, 1997) revealed that ôactivistô was almost equally correlated with ôextraversionô (r = 0.46) and ôpsychoticismô (r = 0.47) and confirmed earlier findings (Furnham, 1992) in which ôactivismô correlated positively with the ôextraversionô and ôpsychoticismô scales of the EPQ.

In the same studies the ôreflectorsô were found to be negatively correlated with the EPQ ôextraversionô scale (r = ï 0.51) and modestly correlated with the NEO-PI ôneuroticismô scale (r = 0.15).

It is interesting to note that amongst the findings in these studies they report that the LSQ ôreflectorô and EPP Reflective scales correlated at 0.13. This raises the point raised earlier about the trait labels having slightly different attributes according to the instruments used. However, in their summary, they report ñthe EPP superfactors of ôextraversionô and ôpsychoticismô are highly related to the LSQ scales.ò But on the other hand, ñNeuroticism seems to have no meaningful relationship with the LSQò.

The ótheoristô dimension is more difficult to describe in terms of the two factors identified since it appears from the data collected that it correlates almost equally with them both. In the absence of similar research findings, it would be interesting to identify what aspects of ótheoristô behaviour contributes to the óreflectorô type behaviour in factor 1 and what aspect contributes to factor 2.

It would appear from the descriptors in the LSQ Handbook that the following would link with factor 1 (reflective behaviours):

- They have time to explore methodically the associations and inter-relationships between ideas, events and situations.
- They have the chance to question and probe the basic methodology or logic behind something.

and factor 2 (pragmatic behaviours):

- They are in structured situations with a clear purpose
- They can listen to or read about ideas and concepts that emphasis rationality or logic and are well argued/elegant/watertight.

The former aspects of ótheoristsô involving probing and having time to explore would seem to equate with reflective behaviour. In the latter, the óclear purposeô and rationality would appear to link with ópragmatismô. Some further research would be necessary to substantiate this.

However, the two-factor model does suggest that the LSQ model does not fall decisively into four dimensions. If there are two dimensions then it is still not yet entirely clear what the behavioural characteristics of each factor are.

Relationship between the CSA and LSQ

We shall look now at the current research data and examine what relationships exist between the CSA and the LSQ instruments.

One of the early study tasks in this research looked at possible relationships between the four aspects of the LSQ instrument, *activist, reflector, theorist* and *pragmatist* and the two dimensions in the CSA *'wholist–analytic'* and *'verbaliser–imager'*. Table 5:12 below sets out the correlations between each of the dimensions.

Table 5:12 Correlations between the CSA and LSQ dimensions

Correlations	WA	VI	Activist	Reflector	Theorist	Pragmatist
WA	1.000	ï 0.043	ï 0.135	0.081	0.121	0.089
VI	ï 0.043	1.000	0.021	0.031	0.012	0.005
Activist	ï 0.135	0.021	1.000	ï 0.446**	ï 0.391**	0.046
Reflector	0.081	0.031	ï 0.446**	1.000	0.535**	0.076
Theorist	0.121	0.012	ï 0.391**	0.535**	1.000	0.402**
Pragmatist	0.089	0.005	0.046	0.076	0.402**	1.000

2ï tailed significance: * < 0.01 ** < 0.001

The correlations between the CSA and LSQ scores are near to zero; the highest correlation being between the WA ratio and ótheoristô. Although there were both negative and positive correlations between the LSQ and the Wholistï Analytic dimension, particularly with regard to óactivistsôand ótheoristsô, correlations with the Verbaliserï Imager dimension were broadly similar (mean r = 0.017) and could be considered as almost zero for all practical purposes. None of the correlations reached a statistically significant level. The practical significance of the findings of this data is discussed below.

Discussion

The current research study aimed at looking for associations between assessing individuals on the Cognitive Styles Analysis (Riding 1991) and the Learning Styles Questionnaire (Honey and Mumford, 1986 revised). Furnham (1995) discusses the problems associated with research into the links between personality, intelligence, educational achievement and cognitive style. He goes on to suggest that cognitive style has a moderating influence on these other factors. Other researchers in the field have tended to focus on the associations between just two or three factors at a time. With the variety of results that have emerged, Furnham suggests that the links between these factors are complex.

The initial hypothesis of the current research was that, within the population as a whole, large group samples would show an even distribution of cognitive style types. This current sample study indicates that, of the research groups represented here, the fire service officer students and general business management students do have different profiles with regard to cognitive style as sampled by the CSA. Other research studies in the field of cognitive style research, using the CSA instrument, also indicate that certain other vocational groups display distinctive profiles (Riding and Rayner, 1998, p.134).

As more research data is gathered using the CSA instrument, it might be possible to see whether there are cognitive style types more suited to certain vocations or types of employment. In a similar way, the Myers-Briggs Type Indicator, which has been

the subject of many research studies over several decades, has accrued a large body of data linking profiles of personality factor types to particular vocational groups.

By extrapolating data from the research by Furnham *et al* (1997) referred to above, it might be possible to suggest that the ówholistï analyticô dimension of the CSA correlates negatively to a small/modest degree with the LSQ óactivistô dimension. If there had been a larger number of subjects in the ówholistô category, it might have interesting to discover whether there was a link between ówholistô and óextroversionô and óactivistô.

However, the descriptors used in the CSA handbook (Riding 1994) would suggest that the óextraversionô aspect of personality is linked more with the óverbaliserô aspect of cognitive style as sampled by the CSA than by the ówholistô style as such. The linkages here are by descriptor rather than by statistical association; the correlations in the current sample being generally low ($r < \pm 0.10$). The research into cognitive style and personality (Riding and Wigley, 1997) supports this. In their research they used three personality tests in conjunction with the CSA; the *EPQ-R Short Scale* (Eysenck & Eysenck, 1991), the *IVE Questionnaire* (Eysenck & Eysenck 1991), and the *State and Trait Anxiety Inventory* (Speilberger, 1977). The correlations between cognitive style and eight personality factors were all low ($r < \pm 0.10$).

The problems of finding stable definitions, or behavioural indicators, for constructs used in the field of personality and cognitive style research has been difficult since each research instrument has been developed on different aspects of some theoretical model. Reviews that compare the various pieces of research (Furnham 1995;

Sadler-Smith, 1997) whilst attempting to bring together common threads to unify meanings, still leaves one with a complexity of definitions to grapple with.

This complexity is compounded by the research background of those exploring the field, (Furnham, 1995, p.404) for example, researchers with a clinical background would tend to focus on the social and interpersonal aspects of cognitive style, whereas those with a background in cognitive psychology would focus on perception and attention. Furnham goes on to recommend some ócconceptual and methodological house-keepingôin order to come to some kind of common view; a point raised by Curry (1983). However, this may be the nature of knowledge probing that there is a process of *progressive differentiation* (Ausubel, 1968) an expanding knowledge field and thus a proliferation of new concepts. What Furnham appears to be recommending is that some superordinate restructuring is required to bring these disparate ideas together.

The current research casts only a small light in what is a large complex field of knowledge about how cognitive style interfaces with the learning process and the problem of matching learners with óappropriateôlearning experiences is but just a part of a larger human interaction jig-saw puzzle.

Whether the CSA instrument alone can accurately identify individuals for particular vocations must be the subject of further confirmatory studies. Amongst other factors that could be considered is the degree to which the vocational activities themselves influence the development of the person and the way in which they have to deal with information. Indeed, are there combinations of other factors at work here, such

factors as perceptual strengths and weaknesses (e.g. good or poor eyesight, hearing etc.), environmental, genetic and diet?

The next chapter looks at cognitive and learning styles and possible links with preferences for types of training delivery. In the study reported in this chapter, there is an attempt to put down markers about the links between the expressive learning preferences as shown by the LSQ and the more inner core processes of cognitive style using the CSA.

Summary

This chapter describes the analysis process carried out on the data collected from students attending the Divisional Command Courses during 1995ï 1997.

The sample, some 163 students, supplied data on the three instruments described in the previous chapter; the CSA, the LSQ, and the preferences questionnaire.

The profile of Fire Service College (FSC) students was compared on both the CSA and LSQ instruments with some data gathered from Business Studies students at another HE institution.

On the CSA the FSC students showed a distinctly different tendency on the ówholistï analyticô dimension as compared with the HE students. Whilst the FSC students tended to be mostly óanalystô, the HE students were more equally distributed along the ówholistï analyticô dimension. These differences were found to be statistically significant beyond the $p<0.01$ level. On the óverbaliserï imagerô dimension distribution of both FSC and HE students was more equal and differences were not significant.

Comparisons with other research samples of the FSC distribution on the ówholistï analyticô dimension revealed similar differences and thus concluded that FSC students were not typical of the wider range from other samples.

Data from the LSQ revealed the FSC sample as being less óactivistô but more ópragmatistô than the HE sample. On the óreflectorô and ótheoristô dimensions the proportions of FSC and HE students were not significantly different.

A factor analysis of the LSQ data gathered from the FSC students revealed two strong factors, and óactionô factor and a óreflectionô factor. The ópragmatistsô dimension loaded highly on the óactionô factor and the óreflectorsô dimension loaded highly on the óreflectionô; óactivistsô were highly negatively loaded on this factor. ôTheoristsô, however, loaded almost equally on both factors.

The data from both the CSA and the LSQ showed very low correlations between the two instruments; ranging from ï 0.13 to 0.12. This would tend to indicate that the two instruments are assessing different aspects of cognitive functioning. The LSQ (sampling at a superficial level) the CSA (at a deeper level) do not appear to be correlated.

The use of the same construct names as descriptors in reports from different instruments such as the CSA and LSQ indicates that there are probably qualitative differences attached to such constructs.

CHAPTER 6

Analysis of Preferences Questionnaire, CSA and LSQ scores

Overview

In this section of the research report, we shall examine the data collected from the Preferences Questionnaire in order to explore relationships, if any, between studentsô preferences for teaching delivery modes and their cognitive and learning styles as assessed by the Cognitive Styles Analysis and the Learning Styles Questionnaire.

Data was also collected, using the Preferences Questionnaire, about how students rated the various delivery modes and the degree to which they were ôhelpfulô to their learning.

The data from the Preferences Questionnaire was subjected to a factor analysis in order to explore the possibility that some simpler structure could explain the types of delivery mode. The relationships between the identified factors and the CSA and LSQ instruments were then also examined.

Data gathering methodology

The derivation of the Preferences Questionnaire using a repertory grid analysis and survey of teaching delivery methods was described in Chapter 4. The questionnaire represented the range of delivery methods used on courses at the College. It should be pointed out that at the time of writing a substantial amount of reorganization was taking place. This involved looking at how courses were being delivered and searching for methods whereby course costs could be reduced and made more cost efficient. The questionnaire was designed to gather information about studentsô preferences for the various delivery methods used on the training programme and also to gather opinions on how helpful they were to their learning.

The questionnaires were distributed to the students by their tutors who pointed out the instructions for completing them. The instructions for completing the form were included on the questionnaire. The students had a very tight timetable schedule, and therefore the method of data entry was made as easy as possible so as to minimise to time taken to complete them. In order to add a degree of legitimacy and credibility to the completion of the questionnaire forms, students were asked to use them as an evaluation form for the training session.

It was felt necessary to do this because DCC students are required during their course to carry out a ôManagement Study Projectô and many of the group were involved in designing their own questionnaires for colleagues to complete. There was, therefore, a danger that distribution of yet another questionnaire might lead to *'questionnaire fatigue'*. However, there were still some problems in asking students to complete

forms as an evaluation exercise, but this will be detailed in the discussion section in Chapter 8. Despite these problems the response rate was generally over 80% for each cohort. After completion, the forms were returned to the tutor and then handed to me for analysis.

The questionnaire (see Appendix 1) instructions requested students to rate each of the 14 delivery modes used on the College programme by using the five point scale ï *Strong preference, Moderate preference, No particular preference, Dislike*, and *Strongly dislike*. Students were also asked to rate each delivery mode on a three point scale to indicate how helpful each mode was to their own learning; *Very helpful, Quite helpful* and *Very little help.*

The data from the questionnaire forms were collated into a spreadsheet, described earlier, that already contained data from the other instruments used ï the CSA and the LSQ; the analysis of the CSA and LSQ data having already been described in Chapter 5.

Initially, the data from the Preference Questionnaire was analysed so as to examine the rank order of the delivery modes based on degree of preference. A similar rank order analysis was done on how helpful students found the various delivery methods to be to their learning.

The first stage of data analysis aimed at looking at the degree of preference for teaching delivery mode regardless of studentsô cognitive style or learning style. The general information from this analysis was designed to help inform future decision-

making about styles of course delivery to be used on newly designed or re-designed courses.

Whilst every effort has been made to balance the use of different teaching methods on courses, little information has been available on how students feel about how they have helped with their learning.

The second stage involved looking at the same data according to studentsô CSA types and their LSQ types and to examine any possible links between preference and style.

Finally, a factor analysis was performed on the data to look for groupings of delivery methods and the predominant teaching/learning modes involved. The findings from this process were then used to examine possible links between the identified factors and style.

In parallel to this, at the time of writing, a long and detailed look is being taken into the current assessment processes and schemes. Any planned changes to these schemes would then have an impact on how courses are delivered.

Particular note is being made of the analyses being carried out on the facility and discrimination indices of items in the question bank used for examinations on the progression courses. A closer examination of the item bank question content and wording is being made in order to look at the proportion of questions that require mere recall and those requiring a ódeeperô level of understanding.

The current predominant practice of óobjective, multiple choiceô assessment formats has encouraged an emphasis on ósurfaceô learning to the detriment of deeper

understanding. An analysis of the assessment questions set in a recent final examination for a course revealed that 77% of the questions were set at the ‘knowledge’ level (in Bloom’s taxonomy terms), the remainder were no higher than the ‘comprehension’ level.

Recent College course developments have focused on training for ‘competence’ and, as a result, a need for students to have a deeper understanding of principles and procedures so that this knowledge can be applied competently. This has influenced some re-thinking of course delivery planning. Criticism from students about the assessments in their course evaluations has prompted some action in proposing alternative assessment schemes.

The data gathered through the Preferences Questionnaire, therefore, has some utility value in informing the decision-making about future course design and in particular how courses might be delivered. This will be discussed in Chapter 8.

The complete set of data from the Preferences Questionnaire was entered into a spreadsheet, (DCCLSQPQ.XLS), for analysis. A separate sheet, within the main file, was compiled for each of the LSQ types, ‘activist’, ‘reflector’ etc., and the data were sorted numerically by score on each type from the ‘very low’ scores to the ‘very strong’. The tables below describe the distribution of these ratings.

Results

In the first stage, the data from the sample of DCC students responding to the Preference Questionnaire were analysed in three main ways: (1) the degree of student preference as a whole regardless of cognitive style (CSA) or learning style (LSQ); (2) preference ratings in relation to CSA category; (3) preference ratings in relation to LSQ type grouping.

In the first analysis, summarized below in Table 6:1, the overall ratings of the student sample are set out. The results of the preferences are tabulated according to their mean ratings and also their mode. In this way it is possible to provide (a) a rank order of preferences ï using the means, and (b) to derive the level of popular preference for delivery method ï using the mode value.

Table 6:1 Average and Mode of the Preference ratings for each Delivery Method

Delivery method	Mean rating	Mode	N=
(DM1) Listening to the lecturer talking	3.72	4	108
(DM2) Looking at pictures/diagrams	3.71	4	95
(DM3) Watching 35mm slides	3.10	3	63
(DM4) Watching video or film	3.93	4	100
(DM5) Demonstration using equipment/floorplans etc.	3.53	4	62
(DM6) Reading course-notes/books	2.86	2	91
(DM7) Writing notes and exercises	3.30	3	92
(DM8) Discussion with tutor	4.09	4	103
(DM9) Discussion with colleagues	4.21	4	106
(DM10) Working on simulated exercises/case studies	4.10	4	92
(DM11) Role play exercises	3.96	4	75
(DM12) De-briefing practical exercises using video	3.84	4	69
(DM13) Library study and researching information	3.36	3	73
(DM14) Using learning materials for study purposes	3.35	3	77

Data from Spreadsheet DCCCSAC2.XLS

In translating these findings into a rank order of preference, the list below (Table 6:2) includes all the delivery modes that received a modal rating of *four* and then rank ordered on the basis of the mean. The number of students is also given for each rating.

Table 6:2 Rank order Preference ratings data for most popular delivery methods

Delivery mode	Modal rating	Mean rating	N= Strong preference	N= Moderate preference	N= No partic. preference	N= Dislike	N= Strong dislike
DM9	4	4.21	40	50	14	2	0
DM10	4	4.10	30	45	15	1	0
DM8	4	4.09	33	48	21	0	1
DM11	4	3.96	20	39	9	7	0
DM4	4	3.93	24	47	27	2	0
DM12	4	3.84	19	29	16	3	0
DM1	4	3.72	20	47	34	5	2
DM2	4	3.71	13	46	32	3	1
DM5	4	3.53	5	32	20	3	0

There appears to be general approval for nine out of the fourteen delivery methods used on the College programme. A visual inspection of the numbers of students rating the delivery methods as ómoderate preferenceô or óstrong preferenceô also indicates this. There is a clear pattern showing delivery methods that involve interaction either with the tutor, or with other colleagues, received a high preference rating.

The overall attributes of the delivery methods listed above include aspects of óinteractivityô and óinvolvementô in the teaching/learning process, or they include óvisually stimulating materialô, e.g. óworking on simulated exercises/case studiesô, órole playô, and ówatching video/filmô. Though most courses used these methods from time to time, more than 55% of course programme time on some progression courses is devoted to óListening to the lecturerô, which was ranked 7th.

The least preferred modes of delivery were:

Rank 10.	Library study, etc.	mean rating	3.36
11.	Using study materials (DM14)		3.35
12.	Writing notes etc. (DM7)		3.30
13.	Watching 35mm slides, etc. (DM5)		3.10
14.	Reading course notes (DM6)		2.86

This shows that the more ópassiveô and less visually stimulating methods of learning were not given such high ratings, e.g. óReading course notes/booksô (mean rating = 2.86, mode = 2) with 39% of students rating it as ódislikeô or óstrongly dislikeô.

As well as looking at studentsô preferences for types of delivery, it was interesting to include in this research an examination of how students found the various delivery methods were helpful to their learning. The table below (Table 6:3) shows the average rating given by students on óhelpfulness to learningô.

Table 6:3 Average ratings on Helpfulness for each Delivery Mode

Delivery mode	Mean	Mode	N=
(DM1H) Listening to the lecturer talking	2.40	2	107
(DM2H) Looking at pictures/diagrams	2.17	2	94
(DM3H) Watching 35mm slides	1.85	2	62
(DM4H) Watching video or film	2.47	3	98
(DM5H) Demonstration using equipment/floorplans, etc.	2.11	2	61
(DM6H) Reading course-notes/books	1.80	2	90
(DM7H) Writing notes and exercises	2.01	2	91
(DM8H) Discussion with tutor	2.58	3	102
(DM9H) Discussion with colleagues	2.66	3	105
(DM10H) Working on simulated exercises/case studies	2.46	3	91
(DM11H) Role play exercises	2.34	3	74
(DM12H) De-briefing practical exercises using video	2.42	3	67
(DM13H) Library study and researching information	2.19	2	72
(DM14H) Using learning materials for study purposes	1.99	2	76

Although the three point rating scale does not show a wide range of discrimination, it is sufficient to give some indication as to which delivery methods were most helpful to students. The rank order of the most helpful delivery methods (rated = 3) is shown in Table 6:4

Table 6:4 Average and mode of Helpfulness ratings and data for each Delivery Method

Delivery mode	Modal rating	Mean rating	N= Very Helpful	N= Quite Helpful	N= Very little help
DM9H	3	2.66	76	24	3
DM8H	3	2.58	62	38	1
DM4H	3	2.47	52	41	4
DM10H	3	2.46	47	41	1
DM12H	3	2.42	33	29	5
DM11H	3	2.34	36	29	7

In terms of helpfulness, it appears that the rank order pattern follows a similar pattern to that of the preferences. Delivery methods involving video (or other moving images)

and those that involve interaction between colleagues and/or their tutor were seen as being most helpful to student learning. õWorking on case studiesô or ósimulated exercisesô, órole-playô and óde-briefing with videoô were seen to be the next most helpful methods.

The least helpful methods appeared to be:

óusing learning materials for study purposesô	Mean =	1.99
õwatching 35mm slidesô		1.85
óreading course notes/booksô		1.80

Delivery methods and cognitive style (by CSA types)

Having looked at the preferences and degree of helpfulness of delivery methods across the whole sample of students, we shall next look at the same data but listed according their cognitive style groupings based on CSA ratio data. The data was examined in order to see if there was any relationship between studentsô preference ratings and their cognitive style ratio. The table below (Table 6:5) shows the correlations between the rank order of preference of the 14 teaching delivery methods and studentsô VI and WA ratio scores.

Table 6:5 Correlations of Delivery Method and WA and VI Ratios

Preference	WA	VI	Helpfulness	WA	VI
DM1	0.084	ï 0.149	**DM1**	0.033	ï 0.070
DM2	ï 0.039	ï 0.020	**DM2**	ï 0.002	0.049
DM3	ï 0.118	0.217**	**DM3**	0.002	0.155
DM4	ï 0.100	ï 0.013	**DM4**	ï 0.001	ï 0.004
DM5	0.104	0.034	**DM5**	ï 0.078	0.258**
DM6	ï 0.133	0.021	**DM6**	ï 0.030	0.089
DM7	ï 0.192*	ï 0.026	**DM7**	ï 0.126	ï 0.065
DM8	ï 0.024	ï 0.041	**DM8**	ï 0.058	0.059
DM9	ï 0.093	ï 0.126	**DM9**	ï 0.078	ï 0.013
DM10	ï 0.136	0.049	**DM10**	ï 0.072	0.098
DM11	ï 0.259**	0.238**	**DM11**	ï 0.134	0.189*
DM12	ï 0.088	ï 0.066	**DM12**	ï 0.154	0.027
DM13	ï 0.014	ï 0.034	**DM13**	0.005	0.093
DM14	ï 0.130	0.090	**DM14**	0.055	0.185*

N=166 df (Nï 2)=164 Critical values: (p<0.05) = 0.1560*, (p<0.01) = 0.2038**

Except in the few cases, which are marked * or **, the correlations suggest that there is little relationship between studentsô WA or VI ratio scores and the preference rating allocated to a delivery method. In the cases that show a statistically significant

correlation, it would appear that DM3 (Watching 35mm slides, etc.) with a high VI score (towards the óimagerô end of the scale) relates to higher ópreferenceô ratings. The large number of negative correlation coefficients would suggest that the rank order of preference has a small inverse relationship with WA score. Although some of the correlations show a statistical significance, the level of practical significance is low.

It must also be noted that this method of delivery (DM3) was generally given a low preference rating, indicating that the range of ratings is somewhat restricted, and therefore the practical significance of this finding is limited except to state that low ratings tend to show a relationship with low CSA ratios, i.e. with 'verbalisers'.

A similar comment can be made about the relationships of data on DM7 (Writing notes and exercises, etc.). This again was one of the less preferred delivery methods (Mean rating = 3.30) but it appears to have a negative relationship to the WA scale; that is, low preference ratings appear to have relationship with a higher WA ratios (i.e. tending towards the óanalyticô end of the scale).

The delivery method that correlates most highly on both WA and VI dimensions is DM11 (Role-play exercises). On the WA scale there is a negative relationship with the preference rating. This would suggest that low ratios on the WA scale (the ówholistô end) relate to high preference ratings for this mode of delivery. It should however be noted that the general skew of WA ratios is towards the óanalyticô end of the dimension and so the implication would be that DM11 is more preferred by the less óanalyticô student. There could therefore be a possible link between this type of

activity and those who tend towards óextroversionô. On the VI dimension there is a positive relationship between ópreferenceô rating and VI ratio. This would imply that DM11 is increasingly preferred by the more óimagerô orientated student.

Turning now to the óhelpfulnessô ratings, there appears to be a general negative correlation (the few positive correlations being near to zero) between óhelpfulnessô ratings and ratio scores on the WA dimension, none of which were statistically significant. On the VI dimension there were three modes of delivery that showed significant relationships with óhelpfulnessô ratings.

1. DM5 (Demonstration using equipment, etc.) showed a positive relationship with the VI dimension. This would suggest that higher VI ratios (óimagersô) gave higher óhelpfulnessô ratings to this mode of delivery; and thus, by implication, this mode is less helpful to óverbalisersô.

2. DM11 (Role-play exercises) showed a positive correlation; thus it would appear that óimagersô (i.e. the higher VI ratio scores) would find this mode of delivery more helpful than óverbalisersô.

3. DM14 (Using learning materials, etc.) would tend to be found more helpful to óimagersô than óverbalisersô; although this mode of delivery was not found to be generally helpful (Mean rating 1.99).

Having looked at the sample as a whole, a more detailed breakdown of the data is discussed below. In the data collection sample, there were no complete parallel data sets collected from ówholist-imagerô type (there being only three subjects of this type

in the whole sample). As the distribution of cognitive style types was heavily skewed towards the óanalyticô end of the WA dimension, it was decided to divide the sample into four equal groups based on the ratio scores. These groups were entitled: Hi-verbal, Moderately verbal, Moderately imager and Hi-imager. The Wholist-Analytic dimension was similarly divided into equal groups. The table below (Table 6:6) shows the average rating for each of the delivery modes by CSA grouping.

Table 6:6 The mean preference rating of each delivery method by CSA ratio grouping

CSA group	Hi-Verbal	Mod-Verbal	Mod-Imager	Hi-Imager	Mean VI	Hi-Wholist	Mod-Wholist	Mod-Analyst	Hi-Analyst	Mean WA	N=
DM1	**4.00**	3.80	3.67	*3.63*	3.74	3.81	*3.40*	3.88	**3.90**	3.72	108
DM2	3.76	3.82	**3.86**	*3.65*	3.71	**4.11**	3.75	*3.50*	3.95	3.71	95
DM3	*2.94*	3.18	3.00	**3.29**	3.10	3.11	**3.38**	3.09	*3.00*	3.13	63
DM4	4.05	**4.24**	*3.87*	3.91	3.93	4.06	**4.17**	*3.90*	4.00	3.93	100
DM5	*3.38*	**3.80**	3.67	3.39	3.53	3.60	**4.00**	*3.00*	**4.00**	3.54	62
DM6	*2.70*	**3.20**	2.86	2.77	2.86	**3.19**	2.88	*2.73*	2.90	2.87	91
DM7	*3.20*	**3.52**	3.23	3.27	3.30	**3.55**	3.40	3.27	*3.00*	3.30	92
DM8	4.19	**4.36**	*4.00*	4.14	4.09	4.22	**4.25**	*4.06*	4.23	4.09	103
DM9	4.36	**4.44**	4.22	*4.13*	4.21	**4.42**	4.35	*4.19*	4.27	4.21	106
DM10	4.10	4.23	**4.32**	*4.00*	4.10	**4.47**	4.31	*3.93*	4.15	4.10	92
DM11	*3.76*	3.78	4.11	**4.16**	3.96	4.31	**4.33**	*3.76*	3.78	3.99	75
DM12	**4.00**	**4.00**	3.94	*3.47*	3.84	3.80	**4.20**	*3.67*	3.81	3.84	69
DM13	3.32	**3.67**	*3.16*	3.28	3.36	**3.67**	3.23	*2.96*	3.65	3.35	73
DM14	*3.05*	**3.69**	3.43	3.17	3.35	3.43	**3.50**	*3.12*	3.42	3.33	77

DM = Delivery Mode

The profile of mean scores across cognitive style grouping for each delivery methods falls roughly into four basic patterns:

1. Linear ï level, rising or falling;
2. óUô-shaped ï symmetrical or asymmetrical;
3. inverted óUô-shaped ï symmetrical or asymmetrical;
4. óSô shaped.

It would appear that the spread of different types of profile indicate a somewhat random, or diffuse, relationship between cognitive style grouping and preference ratings for methods of delivery; that is, there does not appear to be a consistent gradation of CSA ratio scores in relation to each of the two dimensions.

However, a further examination of the data reveals a consistency of mean preference scores given across each of the Hi-Lo CSA groupings for each delivery method. Correlations of the mean preference ratings across the CSA groupings are in the range between 0.92 and 0.76 and are shown in Tables 6:7 and 6:8. It is noticeable that the relationship between mean ratings and the WA dimension ratios is slightly looser than for the VI dimension.

Table 6:7 Correlations between mean delivery method preferences ratings by Verbaliser–Imager ratios

CSA Group	Hi-verbal	Mod-verbal	Mod-imager	Hi-imager
Hi-verbal	ï	0.923	0.905	0.883
Mod-verbal	0.923	ï	0.881	0.824
Mod-imager	0.905	0.881	ï	0.891
Hi-imager	0.883	0.824	0.891	ï

Table 6:7 Correlations between mean delivery method preferences ratings by Wholist–Analytic ratios

CSA Group	Hi-wholist	Mod-wholist	Mod-analyst	Hi-analyst
Hi-wholist	ï	0.824	0.860	0.851
Mod-wholist	0.824	ï	0.780	0.797
Mod-analyst	0.860	0.780	ï	0.764
Hi-analyst	0.851	0.797	0.764	ï

The correlations between each of the different CSA groupings is seen to be high, and this appears to indicate that there is a degree of consistency in allocating the preference ratings by students regardless of their CSA type.

Whilst there appear to be some distinct differences in the mean preference ratings between certain category groups, there is not a consistent pattern of difference, or separation, between each the CSA groupings.

We turn next to examine the pattern of ratings related to ôhelpfulnessõ and cognitive style. The mean ratings for each of the CSA groupings are shown in Table 6:8. Following this, the rank-order correlations are shown in Tables 6:9 to 6:10.

Table 6:8 The mean delivery method helpfulness ratings by CSA ratio groupings

CSA group	Hi-Verbal	Mod-Verbal	Mod-Imager	Hi-Imager	Mean VI	Hi-Wholist	Mod-Wholist	Mod-Analyst	Hi-Analyst	Mean WA	N=
DM1H	2.59	2.28	2.25	2.42	2.39	2.43	2.20	2.36	2.43	2.36	107
DM2H	2.05	2.18	2.27	2.10	2.15	2.28	2.00	2.03	2.25	2.14	94
DM3H	1.80	1.64	1.88	2.06	1.85	1.89	1.77	1.82	1.87	1.84	62
DM4H	2.55	2.43	2.32	2.52	2.46	2.44	2.33	2.32	2.50	2.40	98
DM5H	1.87	2.20	2.20	2.22	2.12	2.20	2.45	1.78	2.21	2.16	61
DM6H	1.79	1.70	1.77	1.91	1.79	1.94	1.63	1.70	1.81	1.77	90
DM7H	2.00	2.10	1.95	1.95	2.00	2.10	2.07	1.93	1.79	1.97	91
DM8H	2.60	2.52	2.52	2.71	2.59	2.72	2.55	2.42	2.59	2.57	102
DM9H	2.62	2.64	2.65	2.63	2.64	2.74	2.70	2.47	2.64	2.64	105
DM10H	2.40	2.32	2.64	2.50	2.47	2.65	2.19	2.41	2.45	2.43	91
DM11H	2.19	2.22	2.50	2.42	2.33	2.62	2.53	2.00	2.33	2.37	74
DM12H	2.38	2.46	2.44	2.35	2.41	2.60	2.40	2.25	2.19	2.36	67
DM13H	2.06	2.33	2.00	2.39	2.19	2.27	2.23	1.88	2.35	2.18	72
DM14H	1.72	2.25	2.00	2.11	2.02	2.00	1.93	1.92	2.11	1.99	76

Table 6:9 Correlations between mean delivery method helpfulness rating by Verbaliser–Imager ratios

CSA Group	Hi-verbal	Mod-verbal	Mod-imager	Hi-imager
Hi-verbal	ï	0.753	0.792	0.824
Mod-verbal	0.753	ï	0.783	0.777
Mod-imager	0.792	0.783	ï	0.816
Hi-imager	0.824	0.777	0.816	ï

Table 6:10 Correlations between mean delivery method helpfulness rating by Wholist–Analytic ratios

CSA Group	Hi-wholist	Mod-wholist	Mod-analyst	Hi-analyst
Hi-wholist	ï	0.850	0.852	0.850
Mod-wholist	0.850	ï	0.615	0.780
Mod-analyst	0.852	0.615	ï	0.800
Hi-analyst	0.850	0.780	0.800	ï

In terms of ôhelpfulnessö to student learning the pattern of ratings is similar to those for preference:

1.	Discussion with colleagues (DM9H)	Mean ratings	2.64
2.	Discussion with the tutor (DM8H)		2.59
3.	Simulated exercises, etc. (DM10H)		2.47
4.	Watching video/film (DM4H)		2.46

The least helpful delivery modes were as follows:

11.	Using learning materials (DM14H)	Mean ratings	2.00
12.	Writing notes and exercises (DM7H)		1.99
13.	Watching 35mm slides (DM3H)		1.85
14.	Reading course notes (DM6H)		1.78

The mean ratings for óhelpfulnessô across each CSA dimension showed similar patterns as for the ópreferencesô. In DM2H, for example, ódooking at pictures, etc.ô the pattern across the VI dimension is an óinverted-Uô, with higher mean values linked with moderate CSA ratio scores. Whereas, on the WA dimension there is óUô distribution with the higher mean scores at the extreme ends of the dimension. Again, the overall picture appears to be a diffuse pattern of relationships of ratings across the various cognitive style types.

Analysis

The data gathered from the Preferences Questionnaire indicated that the distribution of high as opposed to lower ratings on all delivery methods was more diffuse on the óverbalï imagerô dimension than the ówholistï analyticô dimension; the highest and lowest ratings being allocated distributed between óhi-verbalisersô and ómod-verbalisersô, with the imagersô ratings lying in between.

On the ówholistï analyticô dimension, apart from two delivery methods (DM1 and DM5) the ówholistsô tended to rate the other 12 delivery methods more highly than the óanalyticsô. It must also be remembered that because of the skewed distribution in this research sample, ówholistô should be interpreted as being óless analyticô; and that these students generally rated the various methods higher. The exceptions, DM1 (ólistening to the lecturerô and ódemonstrationsô) tended to be more favoured by those who are more óanalyticô; for DM5 this is not so clear-cut. Even this distribution does not present a completely clear picture since the óHi-analystsô mean ratings tended to be higher than the means for the ómod-analystsô.

It appears that generally students, regardless of cognitive style type, preferred delivery methods that involved ómoving imagesô and óinteraction between their tutors and colleaguesô than they did of some of the more passive delivery methods, e.g. ówatching slidesô, óreading course notesô and óusing learning materialsô.

Students rated the use of video more highly than most other methods of delivery. The use of video for teaching, i.e. the showing of training videos, and videos/films of

significant incidents around the world, was given a mean rating of 3.93 (mode 4 ï ómoderate preferenceô). On this method of delivery there was little difference between the ratings given by óverbalisersô and óimagersô The use of video for feedback/debriefing purposes also received a high mean preference rating of 3.84 (mode 4). Interestingly, the Hi-Imager group rated this method (DM12) much lower (3.47) compared with the Hi-Verbaliser group (4.00).

The preferences for more interactive methods of delivery were not generally clear-cut across the ócognitive typesô; ómod-verbalisersô and both óhi- and mod-wholistsô preferred discussions with the tutor and colleagues.

Section summary

An analysis of responses to the questionnaire in relationship to CSA type did not yield any statistically significant associations. This would tend to indicate that there is a more complex relationship between how individuals like to engage in learning new material and their particular cognitive style.

From this data, and the skewed nature of the sample, it is not possible to make any firm links between CSA type and the degree of helpfulness of particular delivery methods for different types of learners.

Delivery methods and learning style (by LSQ types)

We shall now examine the distribution of preference ratings in relation to studentsô LSQ scores. Table 6:11 shows the distribution of students on the Learning Style dimensions according to their LSQ score band levels, the percentages are shown in brackets.

Table 6:11 Number and percentage (in brackets) of the student sample of LSQ types:

Level / Type	Activist	Reflector	Theorist	Pragmatist
Very Strong	15 (9.0%)	19 (12.0%)	26 (16.0%)	26 (16.0%)
Strong	22 (14.0%)	57 (35.0%)	35 (22.0%)	41 (26.0%)
Moderate	67 (42.0%)	48 (30.0%)	61 (38.0%)	53 (33.0%)
Low	44 (27.0%)	22 (14.0%)	33 (21.0%)	31 (19.0%)
Very Low	13 (8.0%)	15 (9.0%)	6 (4.0%)	10 (6.0%)

The tables (Tables 6:12 to 6:15) on the following pages show the mean delivery preference ratings for each LSQ type and level. A summary of the preference patterns is described after each table.

The mean ratings shown in **bold** represent the highest rating group for each delivery method, the ratings shown in *italics* represent the lowest rating group for that delivery method.

Table 6:12 Mean Preference ratings (Activist)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	3.71	3.73	*3.68*	3.73	**4.00**
DM2 Looking at pictures/diagrams	*3.20*	3.64	3.77	3.80	**4.00**
DM3 Watching 35mm slides with commentary	*2.50*	3.13	3.10	**3.22**	3.00
DM4 Watching video/film	3.83	**4.19**	3.80	*3.77*	4.14
DM5 Demonstrations ï equipment and floorplans	*2.33*	3.57	**3.79**	3.50	3.75
DM6 Reading through course notes	*2.40*	**2.91**	2.87	2.69	2.83
DM7 Writing notes/exercises	*3.00*	3.30	3.38	3.07	**3.40**
DM8 Discussion with tutor	4.00	4.04	4.14	*3.93*	**4.43**
DM9 Discussion with colleagues	*4.14*	4.19	4.20	4.27	**4.33**
DM10 Working on simulated exercises/case studies	*3.80*	4.09	**4.13**	4.08	4.00
DM11 Role play exercises	*3.75*	3.94	3.92	3.82	**4.25**
DM12 Debriefing exercises using video	*3.00*	3.80	**3.97**	3.67	3.75
DM13 Library study/researching information	3.67	3.39	*3.19*	3.42	**3.80**
DM14 Using learning materials for study purposes	3.33	**3.48**	*3.21*	3.45	3.40

The ratings allocated by óactivistsô show a mixed pattern overall. There are some clear associations of high preference ratings being associated with high scores on the óactivistô dimension for some of the delivery methods. For example, the following delivery methods DM2 (Looking at pictures, etc.), DM7 (Writing notes/exercises) though generally rated low, DM9 (Discussion with colleagues) and DM11 (Role-play exercises) were allocated high preference ratings by VS óactivistsô and low ratings by VL óactivistsô. The reverse pattern, i.e. high mean ratings linked to L or VL óactivistsô was not clearly evident in relation to any of the delivery methods.

DM4 ôWatching video/filmô and DM14 ôUsing learning materials for study purposesô were given higher preference ratings by (L) óactivistsô but the range of the means was

small; thus suggesting that the mean ratings were similar regardless of LSQ score on this dimension.

The widest range of ratings given by ‘activists’ was for DM5 (Demonstrations ï equipment and floorplans). This method was given a mean rating lying in the ‘Dislike’ range by the (VL) group but was given ratings in the ‘No particular preference’ range by the other LSQ score level groups. (See Table 6:13)

Table 6:13 Mean Preference ratings (Reflector)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	*3.38*	3.73	3.75	**3.88**	3.50
DM2 Looking at pictures/diagrams	3.63	3.60	**3.87**	3.80	*3.43*
DM3 Watching 35mm slides with commentary	**3.43**	*2.57*	3.18	3.00	3.30
DM4 Watching video/film	*3.57*	3.80	4.00	**4.03**	3.86
DM5 Demonstrations ï equipment and floorplans	3.57	**3.83**	3.71	3.61	*3.36*
DM6 Reading through course notes	*2.43*	2.78	**2.93**	2.82	2.83
DM7 Writing notes/exercises	*2.88*	3.30	3.38	3.15	**3.58**
DM8 Discussion with tutor	*3.57*	**4.36**	4.22	4.06	3.92
DM9 Discussion with colleagues	4.25	4.20	**4.41**	4.09	*4.07*
DM10 Working on simulated exercises/case studies	4.14	*3.78*	**4.32**	3.90	4.15
DM11 Role play exercises	3.86	4.00	4.04	*3.74*	**4.36**
DM12 Debriefing exercises using video	3.86	3.71	**4.05**	*3.56*	3.92
DM13 Library study/researching information	**3.50**	*3.00*	3.27	3.27	3.45
DM14 Using learning materials for study purposes	3.14	*2.88*	3.38	3.24	**3.64**

The ratings given by ‘reflectors’ shows a rather more mixed picture in their relationship between LSQ ‘reflector’ scores and preferences for delivery method. The highest ratings for each delivery method appear randomly across the VLï VS range. The mean score range across the VLï VS levels are all less than one rating point,

(SD = 0.47). This would suggest that the score level on the ‘reflector’ dimension does not provide an adequate indication of level of preference for methods of delivery.

Only two of the delivery methods, DM7 and DM14, display any relationship; with the highest ratings being associated with VS scores and low ratings associated with VL or L scores. From a knowledge of student characteristics, one would perhaps naturally associate these two methods of delivery with ‘reflector’ types.

Table 6:14 Mean Preference ratings (Theorist)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	**4.00**	3.71	3.78	*3.58*	3.80
DM2 Looking at pictures/diagrams	3.67	3.80	3.86	*3.39*	**3.92**
DM3 Watching 35mm slides with commentary	3.00	3.00	*2.76*	3.29	**3.60**
DM4 Watching video/film	*3.00*	3.84	4.03	3.92	**4.07**
DM5 Demonstrations ï equipment and floorplans	*3.00*	3.71	3.44	3.62	**3.83**
DM6 Reading through course notes	3.00	*2.39*	**3.10**	2.68	2.92
DM7 Writing notes/exercises	3.00	*2.89*	3.48	3.16	**3.62**
DM8 Discussion with tutor	**4.67**	*3.95*	4.14	4.09	4.07
DM9 Discussion with colleagues	**4.50**	4.24	4.28	*4.04*	4.27
DM10 Working on simulated exercises/case studies	4.00	**4.17**	4.16	*3.90*	4.07
DM11 Role play exercises	4.00	3.88	**4.12**	*3.80*	4.00
DM12 Debriefing exercises using video	*2.50*	4.00	3.62	3.53	**4.25**
DM13 Library study/researching information	3.33	**3.50**	3.27	*3.20*	3.42
DM14 Using learning materials for study purposes	3.33	*3.18*	3.42	3.25	**3.50**

The rating of delivery preferences by ‘theorists’ shows a more distinct pattern in that the (VS) group allocated their highest ratings to seven out of the 14 delivery types but their lowest mean ratings were more randomly distributed. Interestingly, the two

generally most preferred delivery methods were inversely related (DM8 and DM9); the highest ratings being allocated by the VL group This would appear to indicate a possible negative relationship between these delivery types and ótheoristô types. Three delivery methods, DM4 óWatching video/filmô, DM5 óDemonstrations, etc.ô and DM12 óDebriefing exercises using videoô showed a relationship between high mean ratings and high LSQ ótheoristô scores.

In the more general picture, there appeared to be only small differences in ratings given by the VLï VS groupings.

Table 6:15 Mean Preference ratings (Pragmatist)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	3.67	**3.84**	3.83	*3.55*	3.73
DM2 Looking at pictures/diagrams	3.67	3.86	**3.89**	3.71	*3.33*
DM3 Watching 35mm slides with commentary	3.00	*2.42*	**3.40**	2.73	3.00
DM4 Watching video/film	*3.33*	3.88	**4.21**	3.78	3.73
DM5 Demonstrations ï equipment and floorplans	3.20	3.46	**3.68**	3.60	*3.11*
DM6 Reading through course notes	2.67	2.53	3.00	**3.08**	*2.38*
DM7 Writing notes/exercises	*3.00*	3.31	3.17	3.33	**3.54**
DM8 Discussion with tutor	**4.50**	4.05	4.03	4.15	*4.00*
DM9 Discussion with colleagues	**4.67**	*4.05*	4.30	4.11	4.27
DM10 Working on simulated exercises/case studies	4.17	**4.18**	4.14	4.05	*3.85*
DM11 Role play exercises	**4.20**	3.88	*3.86*	4.11	4.00
DM12 Debriefing exercises using video	*3.33*	3.71	3.94	**4.07**	3.75
DM13 Library study/researching information	3.20	**3.60**	3.55	3.41	*2.55*
DM14 Using learning materials for study purposes	3.17	3.38	**3.50**	3.32	*3.09*

The mean ratings of ópragmatistsô showed no clear pattern of distribution. The range of scores was also small (<1.00) (SD=0.51) except for óLibrary study/researching informationô (DM13), which had a mean score range of 1.05. As with ótheoristsô, the generally most preferred delivery methods, DM8 and DM9, appeared to be negatively related to ópragmatistô learning style. A similar inverse pattern was apparent in relation to DM10 óWorking on simulated exercisesô.

General findings across all LSQ types would indicate a mixed picture. No overall pattern of relationships appear to exist between the LSQ instrument and studentsô preferences for delivery methods. However, individual types of delivery did show some level of relationship with different LSQ types.

Helpfulness

The LSQ data related to the degree of helpfulness with learning is shown in the following tables (Tables 6:16 to 6:19)

Table 6:16 Mean Helpfulness ratings (Activist)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	**2.43**	2.42	2.41	*2.27*	**2.43**
DM2 Looking at pictures/diagrams	*1.80*	2.09	2.21	**2.27**	2.17
DM3 Watching 35mm slides with commentary	**2.00**	1.87	*1.72*	**2.00**	1.75
DM4 Watching video/film	**2.50**	2.42	*2.35*	2.46	2.43
DM5 Demonstrations ï equipment and floorplans	*1.00*	2.00	**2.36**	2.10	2.00
DM6 Reading through course notes	*1.40*	1.77	1.74	**1.85**	1.67
DM7 Writing notes/exercises	*1.60*	**2.09**	2.03	2.00	*1.60*
DM8 Discussion with tutor	2.60	*2.46*	2.55	2.64	**2.71**
DM9 Discussion with colleagues	*2.43*	2.56	2.64	2.80	**2.83**
DM10 Working on simulated exercises/case studies	2.60	*2.17*	2.46	**2.77**	2.33
DM11 Role play exercises	*1.50*	2.24	2.25	**2.55**	2.50
DM12 Debriefing exercises using video	*2.00*	2.07	**2.50**	2.44	2.25
DM13 Library study/researching information	2.33	*2.00*	2.13	2.25	**2.60**
DM14 Using learning materials for study purposes	2.00	*1.67*	2.06	2.09	**2.20**

Unlike the óactivistô ratings for ópreferencesô, the distribution of high and low ratings for óhelpfulnessô showed a random spread across the VLï VS range. The following highly rated delivery methods related to VS óactivistsô were DM8, DM9, DM13 and DM14. In these, the lowest mean ratings were allocated by L and VL óactivistsô. In the case of other delivery methods the pattern was not so clear. For example, DM6 and DM11 received the lowest mean ratings by the VL óactivistsô, but the highest

mean ratings were allocated by the S ‘activists’ with the VS ‘activists’ rating them lower.

Table 6:17 Mean Helpfulness ratings (Reflector)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	*2.00*	2.27	2.38	2.47	**2.57**
DM2 Looking at pictures/diagrams	2.25	*1.80*	2.17	**2.28**	2.14
DM3 Watching 35mm slides with commentary	1.86	*1.14*	1.88	**1.94**	1.90
DM4 Watching video/film	2.14	*2.10*	2.34	2.53	**2.57**
DM5 Demonstrations ï equipment and floorplans	*1.86*	2.00	2.12	**2.33**	2.09
DM6 Reading through course notes	*1.57*	1.67	1.75	1.75	**1.83**
DM7 Writing notes/exercises	1.75	*1.50*	2.17	1.92	**2.25**
DM8 Discussion with tutor	2.57	*2.45*	**2.63**	2.48	2.62
DM9 Discussion with colleagues	2.75	2.60	2.66	*2.54*	**2.79**
DM10 Working on simulated exercises/case studies	**2.57**	*2.11*	2.54	2.34	2.54
DM11 Role play exercises	2.29	*2.00*	2.30	**2.39**	2.27
DM12 Debriefing exercises using video	**2.43**	*2.00*	2.38	2.39	2.42
DM13 Library study/researching information	**2.50**	*1.75*	2.00	2.27	2.09
DM14 Using learning materials for study purposes	**2.00**	*1.63*	**2.00**	1.92	**2.00**

The ‘helpfulness’ ratings given by ‘reflectors’ showed little general consistency in relation to the LSQ levels. Only in the case of DM1 and DM6 was there a relationship between high mean ratings and high (VS) LSQ scores. A similar pattern exists for DM4 and DM7, the lowest mean ratings falling within the low (L) LSQ score range.

Table 6:18 Mean Helpfulness ratings (Theorist)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	**2.67**	*2.05*	2.47	2.46	2.53
DM2 Looking at pictures/diagrams	*2.00*	2.05	2.18	2.17	**2.31**
DM3 Watching 35mm slides with commentary	2.00	*1.50*	1.71	2.07	**2.10**
DM4 Watching video/film	*2.00*	2.16	2.44	**2.54**	2.50
DM5 Demonstrations ï equipment and floorplans	2.00	*1.93*	2.11	2.23	**2.33**
DM6 Reading through course notes	**2.33**	*1.28*	1.94	1.68	1.85
DM7 Writing notes/exercises	*1.33*	1.68	**2.19**	2.00	2.08
DM8 Discussion with tutor	**3.00**	*2.35*	2.54	2.61	2.67
DM9 Discussion with colleagues	**3.00**	*2.52*	2.69	2.67	2.73
DM10 Working on simulated exercises/case studies	2.50	*2.28*	**2.58**	2.33	2.43
DM11 Role play exercises	*2.00*	2.13	**2.48**	2.33	2.15
DM12 Debriefing exercises using video	**2.50**	*2.06*	2.38	2.33	**2.50**
DM13 Library study/researching information	*2.00*	2.22	2.09	**2.27**	2.08
DM14 Using learning materials for study purposes	2.00	1.94	*1.88*	2.00	**2.08**

The ótheoristsô ratings did not form a consistent pattern across the various LSQ levels. The two generally popular delivery methods (DM8 and DM9) were given the highest ratings for helpfulness by the VL ótheoristsô, but, this was offset by the lowest mean ratings being allocated by the L ótheoristô group, thus making this an inconclusive distribution. The only delivery methods that allocated the highest mean ratings by VS ótheoristsô and low ratings by L and VL groups were DM2, DM3 and DM5.

Table 6:19 Mean Helpfulness ratings (Pragmatist)

Delivery method	VL	L	M	S	VS
DM1 Listening to lecturer talking	2.33	**2.53**	2.40	*2.28*	2.47
DM2 Looking at pictures/diagrams	2.00	**2.43**	2.29	*1.96*	2.07
DM3 Watching 35mm slides with commentary	**2.00**	1.67	1.90	*1.40*	1.80
DM4 Watching video/film	*2.17*	2.41	**2.61**	2.22	2.27
DM5 Demonstrations ï equipment and floorplans	2.00	*1.92*	**2.26**	1.93	2.11
DM6 Reading through course notes	1.67	*1.60*	**1.88**	1.71	1.69
DM7 Writing notes/exercises	*1.80*	2.00	2.03	1.86	**2.15**
DM8 Discussion with tutor	**2.83**	2.53	2.55	*2.48*	2.60
DM9 Discussion with colleagues	2.83	2.60	2.70	*2.43*	**2.87**
DM10 Working on simulated exercises/case studies	**2.67**	2.59	2.43	*2.18*	2.54
DM11 Role play exercises	**2.60**	2.38	2.38	*1.89*	2.55
DM12 Debriefing exercises using video	2.33	2.36	2.44	*2.13*	**2.50**
DM13 Library study/researching information	2.20	2.20	**2.36**	*1.94*	2.00
DM14 Using learning materials for study purposes	2.00	*1.88*	1.95	1.95	**2.09**

The ópragmatistsô did not show any consistent pattern in relation to their ratings on helpfulness. Five of the delivery methods showed a degree of association mostly by the VL group rating more highly than the S or VS group, but again the other groups (L, M, and S) did not show a consistent gradation of ratings between the highest and lowest ratings allocated.

The relationships of the LSQ scores for each dimension were then examined for each of the preference questionnaire items. Table 6:20 shows these correlations for each of the course delivery methods.

Table 6:20 Correlations of LSQ scores with Preference Questionnaire ratings

	Activist		Reflector		Theorist		Pragmatist	
Item	**Pref'.**	**Helpf.**	**Pref'.**	**Helpf.**	**Pref'.**	**Helpf.**	**Pref'.**	**Helpf.**
DM1	0.071	ï 0.038	0.052	0.196*	0.011	0.164*	ï 0.015	ï 0.034
DM2	0.163*	0.076	ï 0.016	0.089	ï 0.020	0.098	ï 0.109	ï 0.091
DM3	0.145	0.066	0.020	0.139	0.178*	0.253**	0.069	ï 0.108
DM4	ï 0.017	0.012	0.106	0.229**	0.169*	0.145	ï 0.006	ï 0.045
DM5	0.181*	0.182*	ï 0.044	0.173*	0.076	0.172*	0.013	0.048
DM6	0.013	0.076	0.065	0.71	0.076	0.109	0.062	0.032
DM7	ï 0.015	ï 0.031	0.095	0.141	0.167*	0.181*	0.113	0.045
DM8	0.036	0.073	0.009	0.018	0.027	0.103	ï 0.024	ï 0.042
DM9	0.059	0.117	ï 0.112	ï 0.020	ï 0.054	0.024	0.009	0.030
DM10	0.051	0.121	ï 0.006	0.007	ï 0.648	ï 0.008	ï 0.080	ï 0.111
DM11	ï 0.002	0.180*	0.060	0.059	0.030	0.024	0.036	ï 0.079
DM12	0.005	0.093	ï 0.011	0.043	0.119	0.106	0.171*	0.018
DM13	0.005	0.053	0.069	0.012	ï 0.043	ï 0.037	ï 0.118	ï 0.074
DM14	ï 0.033	0.204*	0.160*	0.046	0.061	0.078	0.009	0.125

N=160 df(Nï 2)=158 Critical values: (p<0.05) = 0.159*, (p<0.01) = 0.207**

From this table it appears that many of the delivery methodsô ratings do not correlate very highly with ólearning styleô. Those that show a significant level of association many of them relate to the degree of óhelpfulnessô given. As pointed out earlier in the thesis, though some of the correlations show a statistical significance, they are probably not high enough to have a practical significance.

Analysis of results

In general, the range of the ratings allocated by each of the grades (VLï VS) to each of the delivery methods was relatively small. The variance of the ratings given by all types from the Very Low scoring subjects to the Very Strong on each of the delivery methods was less than one except for Q12 and Q 13, which had s^2=1.17 and 1.13 respectively.

The largest range of ratings was given to ôDemonstrations ï equipment and floorplansô. From the data gathered the VL ôactivistsô group disliked this method of teaching as compared with the more moderate and strong ôactivistsô. This level of discrimination was not demonstrated in any of the other delivery methods.

Although there was general preference for ôDiscussion with tutorô across all four LSQ types and levels, as indicated by the mean ratings, it is interesting to note that only the VS ôactivistsô gave it the highest mean rating. The highest mean ratings for the other LSQ types tended to be given by the VL, L and M groups. The pattern of mean ratings distribution for DM9 ôDiscussion with colleaguesô is also similar.

DM1 ôListening to the lecturer talkingô was preferred by ôactivistsô despite it being a more passive type of delivery. Strong ôreflectorsô (mean score = 3.88) preferred this method of delivery although it was not as well favoured by Very Strong ôreflectorsô (3.50).

There were some unexpected preferences such as DM13 ôLibrary studyô, which was given a higher mean rating by VS ôactivistsô (3.80) than by other LSQ types; this was unexpected since library study might not be generally seen as an active form of

learning. However, further examination of what is involved in this method of learning would suggest that it is a more active method than DM1 ólistening to the lecturerô.

An examination of the correlations between the scores on each LSQ dimension and the ópreferenceô and óhelpfulnessô ratings of each delivery method did appear to show some statistically significant associations. For example, ódemonstrations using equipment etc.ô is deemed to be helpful to óactivistsô, óreflectorsô and ótheoristsô but not ópragmatistsô; it is also a preferred delivery for óactivistsô. óListening to the lecturer talkingô is helpful to óreflectorsô and ótheoristsô ($p<0.05$) but not óactivistsô and ópragmatistsô. Ratings of óhelpfulnessô in ówatching video/filmô appear to be highly associated with studentsô LSQ óreflectorô scores ($p<0.01$). The ótheoristsô ratings of ówatching 35mm slides with commentaryô ($p<0.01$) and ówriting notes and exercisesô ($p<0.05$) would appear to be significantly correlated. óActivistsô scores have a significant association with óhelpfulnessô ratings for órole play exercisesô ($p<0.05$) and ópragmatistsô scores on ópreferenceô for ódebriefing exercises using videoô have a significant association ($p<0.05$)

Some further observations about the association of LSQ type and delivery preferences are analysed in the following section in which the methods of delivery categories are reduced to a number of factor categories.

Factor Analysis of the Preferences Questionnaire

The Preferences Questionnaire about training delivery methods, as discussed in Chapter 1, listed the range of teaching and learning activities included within the Collegeôs training delivery programme. It was not an easy task to identify specific factors directly from the delivery methods since each of them included several aspects of verbal, visual, practical and interactive teaching and learning.

The diffuse pattern of relationship between cognitive and learning style and their preferences for types of delivery method prompted a search for links with a simpler set of delivery modes. In other words, the delivery methods listed in the questionnaire perhaps obscured the underlying reasons for, and constructs used by, individuals when stating their preferences some methods rather than others.

It was proposed to look at identifying a smaller number of factors that could help to clarify the kinds of activities students prefer to engage in when learning. The data was therefore subjected to a factor analysis in order to explore other possible patterns and to reduce the level of complexity posed by the 14 delivery methods.

The factor analysis of the responses to the Preferences Questionnaire yielded five factors with eigenvalues >1.00. Within these five factors, only those delivery methods with factor loadings of 0.5 or greater were selected to form the groupings outlined below.

The analysis of the modes of delivery and their relationship to the factors is shown as follows:

Table 6:21 Factor types

Preference		Rank order	=1
		Mean score	(3.93)
Factor 1	**(Practical / Interactive activities)**	Factor loading	
DM5	Demonstrations using equipment/floorplans etc.	0.514	
DM9	Discussion with colleagues	0.511	
DM10	Working with simulated exercises/case studies	0.851	
DM11	Role play exercises	0.788	
DM12	De-briefing practical exercises using video	0.542	

Preference		Rank order	5
		Mean score	(2.71)
Factor 2	**(Academic activities)**	Factor loading	
DM6	Reading through course notes/books	0.678	
DM7	Writing notes and exercises about the topic	0.812	
DM14	Using learning materials for study purposes	0.851	

Preference		Rank order	4
		Mean score	(3.39)
Factor 3	**(Self-directed activities)**	Factor loading	
DM2	Looking at pictures/diagrams illustrating concepts	0.569	
DM3	Watching 35mm slides + commentary	0.604	
DM13	Library study and researching information	0.714	

Preference		Rank order	3
		Mean score	(3.91)
Factor 4	**(Group interactive activities)**	Factor loading	
DM1	Listening to the lecturer talking	0.803	
DM8	Discussion with the tutor	0.613	

Preference		Rank order	=1
		Mean score	(3.93)
Factor 5	**(Moving image activities)**	Factor loading	
DM4	Watching video or film	0.897	

The five factors accounted for 67.8% of the variance as follows:

Factor 1 26.2%

Factor 2 13.0%

Factor 3 11.9%

Factor 4 8.9%

Factor 5 7.8%

The correlations of the delivery types with the identified factors are set out in Table 6.22 below:

Table 6:22 Correlation between delivery types and identified factors

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Q1 Listening to lecturer talking	ï 0.058	0.094	0.099	**0.802****	ï 0.038
Q2 Looking at pictures/diagrams	0.316*	ï 0.177	**0.569****	0.445**	0.245
Q3 Watching 35mm slides with commentary	ï 0.121	0.104	**0.603****	ï 0.125	0.423**
Q4 Watching video/film	ï 0.131	0.047	0.043	0.075	**0.896****
Q5 Demonstrations ï equipment and floorplans	**0.514****	ï 0.121	0.291*	ï 0.311*	0.305*
Q6 Reading through course notes	ï 0.099	**0.678****	0.181	0.214	ï 0.041
Q7 Writing notes/exercises	0.193	**0.812****	ï 0.028	ï 0.093	0.146
Q8 Discussion with tutor	0.407**	0.408**	ï 0.206	**0.612****	0.185
Q9 Discussion with colleagues	**0.511****	0.363**	0.134	0.194	ï 0.149
Q10 Working on simulated exercises/case studies	**0.851****	0.038	0.165	0.016	ï 0.101
Q11 Role play exercises	**0.788****	0.044	ï 0.012	0.069	ï 0.087
Q12 Debriefing exercises using video	**0.542****	0.287*	0.112	ï 0.410	0.415**
Q13 Library study/researching information	0.316*	0.275*	**0.714****	0.012	ï 0.196
Q14 Using learning materials for study purposes	0.147	**0.620****	0.572**	0.133	0.015

N = 57 Critical values: ($p<0.05$) = 0.273* ($p<0.01$) = 0.354** An arbitrary decision to use correlation values of >0.500 was made in selecting the delivery methods for each factor. These are shown in bold figures.

In summarizing these factors, the basic common features are:

Factor 1: Elements of delivery with highly practical and interactive components.

Factor 2: Elements with a more abstract, non-interactive, academic mode of study.

Factor 3: Elements with high visual, but static, features, including self-directed activities.

Factor 4: Elements that are directed by the lecturer, and are interactive and verbally focused.

Factor 5: Elements that include a high level of visual moving images.

The factor transformation matrix is shown in Table 6:23,

Table 6:23 Correlation between the identified factors

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	0.694	0.515	0.455	0.163	0.140
Factor 2	ï 0.485	0.484	ï 0.018	0.713	ï 0.150
Factor 3	ï 0.475	0.158	0.425	ï 0.271	0.704
Factor 4	0.065	ï 0.690	0.436	0.555	0.150
Factor 5	0.233	ï 0.012	ï 0.650	0.289	0.663

Preferences Questionnaire factors by CSA type grouping

The results of the questionnaire in the spreadsheet were then re-analysed by sorting the delivery methods data into the factor groupings. For consistency, the CSA ratio scores were grouped into the four groupings used earlier. Table 6:24 below shows the mean ratings allocated to each factor by CSA type grouping.

Table 6:24 The mean rating value of preferences (out of 5) related to the factors by CSA ratio score grouping

CSA type\Factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Mean (SD)
Hi-wholist	**4.12**	*3.39*	3.63	4.02	4.06	3.84 (0.318)
Mod-wholist	**4.24**	*3.26*	3.46	3.83	4.17	3.79 (0.430)
Mod-analyst	3.71	*3.04*	3.18	**3.97**	3.90	3.56 (0.425)
Hi-analyst	4.00	*3.11*	3.53	**4.07**	4.00	3.74 (0.414)
Hi-verbal	3.92	*2.98*	3.34	**4.10**	4.05	3.68 (0.494)
Mod-verbal	4.05	*3.47*	3.56	4.08	**4.24**	3.88 (0.342)
Mod-imager	**4.05**	*3.17*	3.34	3.83	3.87	3.65 (0.377)
High-imager	3.83	*3.07*	3.41	3.88	**3.91**	3.62 (0.368)
Means	3.99	3.18	3.43	3.92	4.03	
S.D.	0.167	0.174	0.145	0.237	0.132	

Table 6:25 The mean rating value of 'helpfulness (out of 3) related to the factors by CSA ratio score grouping

CSA type\Factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Mean (SD)
Hi-wholist	2.56	*2.01*	2.14	**2.58**	2.44	2.35 (0.257)
Mod-wholist	**2.46**	*1.87*	2.00	2.38	2.33	2.21 (0.258)
Mod-analyst	2.18	*1.85*	1.91	**2.39**	2.32	2.13 (0.241)
Hi-analyst	2.36	*1.90*	2.16	**2.51**	2.50	2.29 (0.258)
Hi-verbal	2.29	*1.84*	1.97	**2.60**	2.55	2.25 (0.339)
Mod-verbal	2.37	*2.02*	2.05	2.40	**2.43**	2.25 (0.201)
Mod-imager	**2.49**	*1.91*	2.05	2.39	2.32	2.23 (0.243)
High-imager	2.42	*1.99*	2.18	**2.57**	2.52	2.34 (0.245)
Means	2.39	1.92	2.06	2.48	2.43	
S.D.	0.120	0.073	0.096	0.097	0.094	

In terms of practical significance for the training of Fire Service officers the data collected would support training being concentrated on modes of delivery as follows (in order of preference):

Factor 5: Elements that have a high level of visual moving images.

Factor 1: Elements of delivery with highly practical and interactive components.

Factor 4: Elements that are directed by the lecturer and involve interpersonal interaction.

Much less favoured are:

Factor 3: Elements with a high visual, but static, features, and self-directed activities.

Factor 2: Elements with a more abstract, non-interactive, and academic modes of study.

Data related to the helpfulness of modes of delivery in studentsô learning, the degree of helpfulness follows a similar pattern of relationships to their cognitive style; factor 4 has a slightly higher mean óhelpfulnessô rating followed by factor 5.

In detail, an examination of the CSA type preferences data would suggest that ówholistsô (i.e. the less analytic) have high preference for delivery methods included in factor 1, i.e. DM5, DM9, DM10, DM11 and DM12. óAnalyticsô allocated their highest mean rating to delivery methods in factor 4; thus suggesting that they prefer delivery methods that involve some degree of interaction and guidance from tutors.

On the CSA óimagerô end of the scale, a higher preference was given for delivery methods in factor 5 (DM4 ówatching video...ô); but ómoderate-imagerô gave higher preference to delivery methods in factor 1 involving practical exercises and demonstrations.

óHigh-verbalisersô preferred more interactive methods of teaching and learning, whereas ómoderate-verbalisersô gave higher preference to the moving visual materials in factor 5.

From the data on óhelpfulnessô it would appear that óverbalisersô gave a higher mean rating (2.54) to factor 5 delivery methods as compared with óimagersô; though of the CSA types, óbimodalsô found factor 5 relatively least helpful (2.48).

In terms of óhelpfulnessô of delivery methods, those in factor 4 (Interactive and tutor-led activities) were preferred across the ówholistï analyticô dimension except in the case of ómoderateï wholistsô who preferred those in factor 1 (practical activities).

On the óverbalï imagerô dimension, delivery methods in factor 4 were preferred by those at the extremes of the dimension, whereas those in the middle of the distribution preferred either factor 1 (moderate-imagers) or factor 5 (moderate-verbalisers).

An analysis of variance of the CSA and preferences data identified some interaction between the factors linked to the delivery methods and the óverbalï imagerô dimension. Table 6:26 shows the means and SDs of the preference ratings by factor and by WAï VI dimensions. The WAï VI scores have been divided into high and low groups based on the mean ratio scores on each of the dimensions.

Table 6:26 Analysis of variance of CSA WA–VI dimensions by Factor

Factor 1	Verbaliser	Imager
Analyst	3.745 (0.391)	4.025 (0.536)
Wholist	4.200 (0.471)	4.182 (0.590)

Factor 2	Verbaliser	Imager
	2.939 (0.611)	3.021 (0.509)
	2.976 (0.722)	3.061 (0.880)

Factor 3	Verbaliser	Imager
Analyst	3.273 (0.467)	3.542 (0.619)
Wholist	3.476 (0.676)	3.364 (0.640)

Factor 4	Verbaliser	Imager
	4.182 (0.717)	3.813 (0.602)
	3.857 (0.569)	3.636 (0.951)

Factor 5	Verbaliser	Imager
Analyst	3.909 (0.831)	3.563 (0.512)
Wholist	4.214 (0.802)	3.636 (0.809)

Mean scores (SDs)

MANOVA – Verbaliser–Imager by Factor F=2.67 p<0.05

The CSA data used in the earlier tables use the categorical information presented by the software. However, in Table 6:26 this data was recoded so that the Hi- and Lo-groups represent 50% of the sample.

As mentioned earlier, the distribution on the WA dimension was heavily skewed towards the ôanalyticô end of the construct pole. The ôwholistô data therefore should be interpreted as being ôless analyticô.

A two-way analysis of variance of factor and ôverbal-imageryô style , and factor and ôwholist-analyticô style was performed on the data. There was no significant effect between factor and ôwholist-analyticô style. However, on the ôverbal-imagerô dimension there was a significant effect (F = 3.64; df = 4; p = 0.034).

The mean score differences between the Hi- and Lo- groups for each factor are as follows: Factor 1 = 0.035; Factor 2 = 0.036; Factor 3 = 0.082; Factor 4 = 0.288; Factor 5 = 0.473. The implications of these results are discussed later.

Preferences Questionnaire factors by LSQ type grouping

The results of the questionnaire in the spreadsheet were then re-examined according to the LSQ scores using the data on delivery methods in their factor groupings. The following tables 6:27 to 6:30 show the mean preference ratings across the range of factors for each of the score levels on each of the four LSQ dimensions.

Table 6:27 Mean Preference ratings (Activist)

LSQ Activist	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Mean (SD)
Very low	3.41	*2.91*	3.12	**3.86**	3.83	3.43 (0.422)
Low	3.92	*3.23*	3.39	3.88	**4.19**	3.72 (0.399)
Moderate	**4.00**	*3.15*	3.35	3.91	3.80	3.64 (0.372)
Strong	**3.87**	*3.07*	3.48	3.83	3.77	3.60 (0.335)
Very strong	4.02	*3.21*	3.60	**4.21**	4.14	3.84 (0.422)
Means	3.84	3.11	3.39	3.94	3.95	
S.D.	0.250	0.130	0.178	0.155	0.202	

Table 6:28 Mean Preference ratings (Reflector)

LSQ Reflector	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Mean (SD)
Very low	**3.94**	*2.82*	3.52	3.47	3.57	3.46 (0.405)
Low	**3.95**	*3.07*	3.20	3.92	3.79	3.54 (0.466)
Moderate	3.85	*3.26*	3.34	4.02	**4.11**	3.72 (0.392)
Strong	**4.08**	*2.95*	3.53	3.96	3.93	3.69 (0.463)
Very strong	**3.94**	*3.36*	3.37	3.73	3.91	3.66 (0.283)
Means	3.95	3.09	3.39	3.82	3.86	
S.D.	0.082	0.221	0.137	0.224	0.199	

Table 6:29 Mean Preference ratings (Theorist)

LSQ Theorist	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Mean (SD)
Very low	3.73	*2.71*	3.24	**3.75**	3.50	3.39 (0.430)
Low	**4.09**	*3.08*	3.54	3.92	3.86	3.69 (0.399)
Moderate	3.84	3.22	*3.15*	3.91	**3.98**	3.62 (0.401)
Strong	3.85	*3.00*	3.53	3.88	**4.15**	3.68 (0.440)
Very strong	**4.34**	*3.66*	3.83	4.19	4.00	4.00 (0.272)
Means	3.97	3.13	3.46	3.93	3.90	
S.D.	0.245	0.348	0.270	0.160	0.245	

Table 6:30 Mean Preference ratings (Pragmatist)

LSQ Pragmatist	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Mean (SD)
Very low	3.89	*3.00*	3.33	**4.08**	3.38	3.54 (0.440)
Low	3.92	*3.10*	3.25	3.88	**4.17**	3.66 (0.463)
Moderate	**3.95**	*3.22*	3.56	**3.95**	3.83	3.70 (0.313)
Strong	**3.82**	2.98	*2.84*	3.62	3.69	3.39 (0.446)
Very strong	4.01	3.46	*3.42*	**4.06**	3.75	3.74 (0.298)
Means	3.92	3.15	3.28	3.92	3.76	
S.D.	0.070	0.197	0.271	0.186	0.284	

The preference ratings in relation to studentsô LSQ scores and the factor groupings follow a fairly consistent pattern in one respect, namely, the delivery methods in factor 2 (Academic activities ï reading course notes and using study materials) This factor was given the lowest mean rating values across each of the LSQ dimensions and was not dependent on the LSQ score level. There were just two exceptions to this, namely, ómoderateï theoristsô and óstrongï pragmatistsô considered delivery methods in factor 3 (self-directed activities) as being the least preferable.

The moderate to very strong ôactivistsô appear to have strong preferences for delivery methods in factor groups 1 and 4. These would include preference for practical exercises and role-play and opportunities for interactive and tutor led activities.

Both low and high scorers on the LSQ ôreflectorô dimension also gave their highest preference to factor 1 delivery methods, although students in the moderate range gave a stronger preference for the use of video and film followed by group interactive activities.

ôTheoristsô, whose LSQ scores were in the ômoderateô to óvery strongô range, gave their highest preferences to factor 5 and factor 1 delivery methods ï reference to the detail in Table 6:14 would suggest that methods that had a high visual content were preferred.

An analysis of variance of the LSQ data by factor was carried out by comparing each of the LSQ groups (A, R, T and P) according to whether subjects belonged to a high or low (Hi ï Lo) scoring group. These Hi- / Lo- groups were allocated so that 50% of the sample were included above and below the cut-off point. A summary of this data is shown in Table 6:31.

Table 6:31 Mean Preference ratings by LSQ learning style

Factor 1	Lo-Act	Hi-Act	Lo-Refl	Hi-Refl	Lo-Theor	Hi-Theor	Lo-Prag	Hi-Prag
Hi-Act	ï	ï	3.947	3.900	3.918	3.975	3.825	3.988
Lo-Act	ï	ï	4.200	4.200	4.262	4.133	4.137	4.311
Hi-Refl	4.200	3.900	ï	ï	4.125	4.029	4.036	4.091
Lo-Refl	4.200	3.947	ï	ï	4.045	4.000	3.957	4.107
Hi-Th	4.133	3.975	4.000	4.029	ï	ï	3.889	4.117
Lo-Th	4.262	3.918	4.045	4.125	ï	ï	4.050	4.086
Hi-Prag	4.311	3.988	4.107	4.091	4.086	4.117	ï	ï
Lo-Prag	4.137	3.825	3.957	4.036	4.050	3.889	ï	ï

Factor 2	Lo-Act	Hi-Act	Lo-Refl	Hi-Refl	Lo-Theor	Hi-Theor	Lo-Prag	Hi-Prag
Hi-Act	ï	ï	2.965	3.333	2.980	3.208	3.250	2.961
Lo-Act	ï	ï	2.967	2.956	2.974	2.944	2.875	3.111
Hi-Refl	2.956	3.333	ï	ï	3.208	2.929	2.879	3.182
Lo-Refl	2.967	2.965	ï	ï	2.894	3.190	3.048	2.889
Hi-Th	2.944	3.208	3.190	2.929	ï	ï	3.037	3.000
Lo-Th	2.974	2.980	2.894	3.208	ï	ï	2.938	3.024
Hi-Prag	3.111	2.961	2.889	3.182	3.024	3.000	ï	ï
Lo-Prag	2.875	3.250	3.048	2.879	2.938	3.037	ï	ï

Factor 3	Lo-Act	Hi-Act	Lo-Refl	Hi-Refl	Lo-Theor	Hi-Theor	Lo-Prag	Hi-Prag
Hi-Act	ï	ï	3.421	3.611	3.373	3.667	3.417	3.490
Lo-Act	ï	ï	3.367	3.467	3.462	3.389	3.354	3.556
Hi-Refl	3.467	3.611	ï	ï	3.625	3.405	3.394	3.576
Lo-Refl	3.367	3.421	ï	ï	3.333	3.619	3.333	3.467
Hi-Th	3.389	3.667	3.619	3.405	ï	ï	3.296	3.611
Lo-Th	3.462	3.373	3.333	3.625	ï	ï	3.396	3.429
Hi-Prag	3.556	3.490	3.467	3.576	3.429	3.611	ï	ï
Lo-Prag	3.354	3.417	3.333	3.394	3.396	3.296	ï	ï

Table 6:31 *(continued)* **Mean Preference ratings by LSQ learning style**

Factor 4	Lo-Act	Hi-Act	Lo-Refl	Hi-Refl	Lo-Theor	Hi-Theor	Lo-Prag	Hi-Prag
Hi-Act	ï	ï	3.895	4.083	3.853	4.125	4.188	3.824
Lo-Act	ï	ï	3.650	3.867	3.692	3.875	3.781	3.778
Hi-Refl	3.867	4.083	ï	ï	3.688	4.071	3.864	4.000
Lo-Refl	3.650	3.895	ï	ï	3.818	3.786	3.964	3.667
Hi-Th	3.875	4.125	3.786	4.071	ï	ï	4.111	3.875
Lo-Th	3.692	3.853	3.818	3.688	ï	ï	3.813	3.750
Hi-Prag	3.778	3.824	3.667	4.000	3.750	3.875	ï	ï
Lo-Prag	3.781	4.188	3.964	3.864	3.813	4.111	ï	ï

Factor 5	Lo-Act	Hi-Act	Lo-Refl	Hi-Refl	Lo-Theor	Hi-Theor	Lo-Prag	Hi-Prag
Hi-Act	ï	ï	3.737	3.833	3.647	4.000	3.500	3.882
Lo-Act	ï	ï	3.800	4.000	3.846	4.000	4.063	3.667
Hi-Refl	4.000	3.833	ï	ï	3.750	4.071	4.273	3.636
Lo-Refl	3.800	3.737	ï	ï	3.727	3.857	3.571	3.933
Hi-Th	4.000	4.000	3.857	4.071	ï	ï	4.111	3.917
Lo-Th	3.846	3.647	3.727	3.750	ï	ï	3.750	3.714
Hi-Prag	3.667	3.882	3.933	3.636	3.714	3.917	ï	ï
Lo-Prag	4.063	3.500	3.571	4.273	3.750	4.111	ï	ï

Of the various paired groupings, only the ‘reflectorô by ‘pragmatistô by ‘factorô association reached a statistical level of significance, see Table 6:32.

Table 6:32 Analysis of variance of Reflectors by Pragmatists by Factor

Factor 1	Lo-Reflector	Hi-Reflector
Hi-Pragmatist	4.138 (0.424)	4.033 (0.608)
Lo-Pragmatist	3.957 (0.509)	4.050 (0.560)

Factor 2	Lo-Reflector	Hi-Reflector
	3.133 (0.745)	3.111 (0.720)
	3.019 (0.478)	3.111 (0.823)

Factor 3	Lo-Reflector	Hi-Reflector
Hi-Pragmatist	4.468 (0.676)	3.462 (0.569)
Lo-Pragmatist	3.333 (0.489)	3.444 (0.757)

Factor 4	Lo-Reflector	Hi-Reflector
	3.875 (0.778)	4.000 (0.643)
	3.955 (0.739)	3.825 (0.694)

Factor 5	Lo-Reflector	Hi-Reflector
Hi-Pragmatist	4.000 (0.633)	3.880 (0.646)
Lo-Pragmatist	3.750 (0.967)	4.200 (0.834)

Means (SDs)

MANOVA – Reflector by Pragmatist by Factor F=3.16; df=188; p<0.05

Although, a visual inspection of the data suggests that in the case of ófactor 5ô, the means of the óHi-reflectorsô and óLo-pragmatistsô and *vice versa* (Hi-pragmatists and Lo-reflectors) are similar, this pattern of means is not clearly identifiable in the case of the other factors.

One should note that the means in these tables do not match those in Tables 6:27 to 6:30 owing to the different groupings. In the earlier tables, the data is grouped according to the five levels of óstrengthô based on the normative criteria of the LSQ Handbook (Honey and Mumford, 1986). Table 6:31 is based on recoding each dimension as follows: óLo-activistô scores 0 ï 8, óHi-activistô 9 ï 20; óLo-reflectorô 0 ï 14, óHi-reflectorô 15 ï 20; óLo-theoristô 3 ï 13, óHi-theoristô 14 ï 20, and óLo-pragmatistô 5 ï 13, óHi-pragmatistô 14 ï 20.

Discussion

Data from the Preferences Questionnaire has provided a general picture of what teaching and learning conditions students prefer. Whilst the delivery methods included in the questionnaire have not covered the complete range of options that are generally available in many institutions, the ones included do represent what the Fire Service College offers in the current programme. One of the main problems with using these categories for this research has been the trade-off between using a larger number of categories that could have been kept more conceptually discrete, and a smaller number of categories that were conceptually more complex. The latter option was selected as an expedient way of making the preferences questionnaire easier to complete for students who had a crowded coursework schedule. The response rate overall for the questionnaire returns was 102 out of 174 (58.6%). Whilst this was a workable sample for some of the groupings, the group sizes were much reduced when looking at multiple relations between preferences and learning/cognitive style types. This has meant that the possible significance of findings has been reduced.

Despite this state of affairs, the general picture gathered so far suggests that delivery methods in factors 2 and 3 (academic study and self-directed study options) are the least preferred options for FSC students. Although the students in the sample tend towards the ôanalyticô pole of the WA (CSA) dimension and tend to be stronger on the ôreflectorô dimension of the LSQ, one might tend to expect that they would have a preference for self-directed learning activities in a mainly solitary situation; From this evidence this appears not to be so.

However, the general preference for interactive and practical activities would suggest that FSC students enjoy learning in group situations and find them more helpful.

The DCC course programme does involve a substantial amount of group work apart from the direct teaching aspects of the course. The homogeneity of the DCC student sample has, however, not enabled any strong conclusions to be drawn with regard to a wider linkage between cognitive style and their preferences for course delivery. The predominance of ôanalyticsô in the sample and the scarcity of ôwholistsô has meant that comparisons have had to be based on degrees of ôanalytic-nessô. Therefore, further samples covering a wider range of styles would be needed before any conclusions could be made.

The high correlations of preference ratings between the various CSA groupings would again reinforce the view that this particular sample is quite homogeneous. But in terms of studentsô cognitive style and their ratings of the five factors, an ANOVA indicated there was some significant effect between ôfactorô and the ôverbalï imagerô dimension ($F=2.67$; $df=192$; $p<0.05$;) but no similar effect was observed on the ôwholistï analyticô dimension. Exactly where the interactive effect of VI style on factor lies can probably be gained from Table 6:22 where the rating ôslopeô tends to increase from ôimagerô to ôverbaliserô on factor 4 (activities that are tutor directed/involve interpersonal interaction).

An ANOVA on the Factors and the LSQ identified a significant effect of ôreflectorô and ôpragmatistô by Factor ($F=3.16$; $df=188$: $p<0.05$). Looking at the associations between LSQ scores and preference ratings for each of the other learning style in the

tables above (Tables 6:24 to 6:27), the range of mean ratings show a degree of uniformity.

The correlations between LSQ type and delivery method factors are generally low (range ï 0.09 to 0.17). From this information, and the similar findings regarding the Cognitive Styles Analysis, one could begin to question whether there is an association between learning style and the way the environment presents the learning situation, i.e. the way material is presented. It would appear that one needs to look more closely at the type of processing and adaptation that individuals adopt when faced with a variety of learning stimuli.

The factor analysis of the LSQ, described earlier, suggested that this instrument had two major ótypesô rather than four ï óactionô and óanalysisô (Allinson and Hayes, 1990) ï and that in the current research the óactionô dimension appears to be associated with the ópragmatistô style (rather than the óactivistô as suggested by Allinson and Hayes), and the óanalysisô dimension with the óreflectorô style.

From this analysis there appears to be some interaction between óhi-reflectorsô and ólo-pragmatistsô, and ólo-reflectorsô and óhi-pragmatistsô. This would tend to suggest that those students who are more reflective would also tend to be less active in the pragmatic sense; they are perhaps óthinkersô rather than ódoersô.

Summary

This chapter describes the data findings resulting from the Preferences Questionnaire, which was devised to gather studentsô views of training delivery methods used at the Fire Service College. The questionnaire requested information on two aspects of studentsô responses to methods of delivery; firstly their likes and dislikes, and secondly their views on how helpful each method was for their own learning.

The data gathered was used and analysed in several different ways; firstly to rank order the delivery methods, secondly to search for associations with ólearning styleô and ócognitive styleô and thirdly to look for what factors could simplify the number of training delivery mode types.

The preferences revealed that activities involving interaction between peers and with the tutors were highly preferred; as were activities that involved role-play and simulated exercises and case studies. The least preferred modes of delivery were those that involved learning from self-study material, books and looking at illustrations on 35mm slides.

The methods of course delivery that were found to be most helpful to studentsô learning were again the opportunities for interaction between peers and their tutors followed by the use of video material. The least helpful methods were again the use of self-study material and reading books and course notes.

The relationships between ócognitive styleô and course delivery preferences were statistically inconclusive except in the case of three items. These items include

ówatching 35mm slidesô, which showed a significant correlation with ómagerô strength on the VI dimension; ówriting notes and exercisesô correlated with the more ówholistô students (or, conversely this was disliked by óanalystsôï who make up the largest group in the sample); and órole play exercisesô were preferred by the more ówholistô students and the more ómagerô types.

In terms of óhelpfulnessô, correlations were not as significant. The ódemonstration using equipment/floorplansô method of delivery was found to be more óhelpfulô to ómager' types, as were órole play exercisesô; and óusing learning materials for study purposesô but only to a lesser extent.

The LSQ score relationships showed some significant levels of association with particular methods of delivery. More significant correlations were found with respect to ratings for óhelpfulnessô than for ópreferencesô. High levels of association for both ópreferenceô and óhelpfulnessô were found in the following cases:

- Theorists and ówatching 35mm slidesô
- Activists and ódemonstrations using equipment/floorplansô
- Theorists and ówriting notes and exercisesô

A factor analysis of the delivery mode types preference ratings identified two strong factors and three further factors with eigenvalues greater than 1.00.

The factors were characterized by the following descriptions:

- Factor 1: Practical and interactive activities
- Factor 2: Academic activities
- Factor 3: Self-directed activities

- Factor 4: Group interactive activities
- Factor 5: Moving image delivery methods (e.g. video)

Having identified these five main areas of training delivery types, their associations with CSA and LSQ types were explored. A two-way ANOVA identified a significant effect between ófactorô and óverbaliserï imagerô cognitive style. A significant effect was also found between ófactorô and LSQ óreflectorô and ópragmatistô dimensions.

CHAPTER 7

Analysis of CSA response data

Overview

In this part of the report, the data obtained from the CSA data files is analysed and described. The CSA data files provide evaluation statistics about subject reponses. The information contained therein includes subjectsô response times and an indication as to whether they gave a correct/incorrect response for each question. A more detailed analysis of the data aims at exploring different rates of processing by both CSA type and by LSQ type.

During an early examination of the data-files, it was noticed that responses to some questions took considerably longer to process than others and this prompted the question as to why this should be so. Following on from this was a question as to whether speed of processing, as measured by the CSA instrument, could yield other patterns in relation to an individualôs score profile on the Learning Styles Questionnaire data.

The data files

The main details of the data gathering methods have been covered in Chapter 1 but a few further comments are pertinent to this part of the research study.

The responses made by subjects using the CSA instrument are recorded in a text file (i.e. ASCII format). Each new subject using the CSA has their data appended to the file, rather than creating a new file for each subject. Periodically the data files were transferred to a copy file and the original erased; this was done to prevent the data file becoming excessively long and accumulated data from other casual users becoming interspersed amongst the target student data. The copied ASCII files were then imported into a spreadsheet; the data being in a ócomma delimited formatô each comma prompting the software to position each piece of datum in a separate cell.

The data contain not only the response times to each question but also a summary for each subject that includes the mean scores for both positive and negative exemplar questions as well as the ratio for both WA and VI dimensions.

A range of spreadsheets was constructed to present Verbal/Imager data separately from Wholist/Analytic data. The subjectsô data were also sorted into their CSA groupings (1ï 9) in order to identify any emerging relationships. The data were also sorted according to subjectsô scorings on the LSQ instrument. The five gradings on each LSQ dimension ï Very Strong to Very Low ï were reduced to three ï Hi-group, Moderate and Lo-group ï for the purpose of this analysis. The analysis was similarly used to identify any emergent patterns.

During the first week of their course, the Divisional Command Course (DCC) students have an IT familiarisation course, in which the tool skills of wordprocessing and using spreadsheets are demonstrated; these are the particular pieces of software that they will need to produce their own management study project (MSP) reports. It is during this part of the course that they have access to computers and they are introduced to the CSA software, the results of which are then used later in their course on sessions entitled, ôUnderstanding yourselfô and ôUnderstanding peopleô.

After students have been introduced to the CSA software, and the reasons for using it, they are instructed to enter their name and student registration number, if known. During the early stages of the research, however, some of the students were either reluctant to provide their names on the grounds of confidentiality, or they were somehow averse to treating the exercise seriously. Since some students on these earlier cohorts had used pseudonyms, it was difficult to pair up CSA data for analysis with that of other instruments used. To complicate matters further, the data files also contained information about students attending other courses. Students on the other courses were not required to provide data using the LSQ and neither were they given the Preferences Questionnaire to complete.

Some interesting reactions were received about the CSA software particularly about its face validity. Much of this seemed to be based on views about the degree of sophistication of the information that could be obtained from the instrument compared with the simplicity of the questions. For some students the instrumentôs very simplicity was met with a less than serious response.

Careful inspection of the data file printouts was helpful in identifying those who had responded with a less than positive attitude; these studentsô responses exhibited erratic patterns of correct/incorrect responses and was frequently linked with very fast repeated key pressing (i.e. very short key pressing response times). Data from these subjects were deleted from the spreadsheet and the data was disregarded.

Also, a certain amount of incomplete data had to be stripped out initially in order to perform an analysis of the data; incomplete data sets could not be used in conjunction with other matched sets. Some data sets were incomplete; this being due to some individuals, for one reason or another, who did not respond to one or other of the instruments used in this study.

During the research period, new IT equipment was installed in the computer training suite. For some reason during the installation of the CSA software on the new equipment, the data file from one of the previous PCs had been copied over on to all the new PCs. A subsequent examination of the new data files revealed a wholesale duplication of data. Some considerable effort was expended in identifying and eliminating duplicate sets of data. Finally, a total of 174 subjects provided usable data from the CSA data files. However, when pairing up this data with students who had also completed the Learning Styles Questionnaire, the remaining matched sets of data produced a much reduced sample size of 83.

The remainder of this chapter will examine the general findings from the total set of data (N=159) and in particular at the relationships of processing speeds and Cognitive Style type. Next, there is an examination of the relationships between the processing speeds and the LSQ types (N=83). This later study was prompted by other research (Furnham, Jackson, *et al* 1997; Riding and Wigley 1997) that examined a possible correlation between *impulsivity* as measured on the Eysenck measures of personality (EPP and EPQ-R respectively) and cognitive and learning style.

This present sub-study therefore aimed at looking particularly at the differences in processing speed of LSQ Activists; since there was a reported link between Activists (LSQ) and Psychoticism (r = 0.46 on the EPP, and r = 0.38 on the EPQ). The Psychoticism superfactor includes the factor *impulsive*, which correlates highly with Activist (r = 0.57) but negatively with Theorist (r = ï 0.39) and Pragmatist (r = ï 0.28) (Furnham et al, 1997).

In contrast to these research findings, Jones (1997) discusses the ówholistï analyticô dimension in contrast with the óreflectionï impulsiveô construct and suggests that the Wï A construct dimension is less value laden in the sense that an individualôs placement at either end of the dimension does not put them at a disadvantage as compared with their position on the Rï I construct. On the latter construct, an individual who is assessed as being at the óimpulsiveô end of the construct is frequently considered to be socially, and educationally, at a disadvantage.

In this current study it is proposed to consider whether there is a quantitative link, i.e. in terms of processing speed, between the Wï A dimension and óimpulsivityô; since it

would appear from the discussion of research quoted above that the qualitative aspects of the Wï A and Rï I constructs are not exactly parallel. Since a direct measure of impulsivity was not included in this study, some other indirect measure, and therefore a certain amount of inference, was used to examine the correlations between the Wï A (CSA) dimension and the óactivistô dimension of the LSQ; the premise being that the latter appeared to correlate with óimpulsivityô (Furnham et al, op. cit.).

Finally, there are some specific items of note that relate to individual questions within the CSA. Research by Collins and Quillian (1969) predicted that processing time was dependent on *semantic distance.* They found that processing speed increased in duration according to the *semantic distance* of a subject from its ópredicateô within a semantic network. This is probably best described in terms of how the name of a specific object relates to a higher order concept label. For example, ódogô and ómammalô, as compared with ódogô and óanimalô. As all mammals are animals but not all animals are mammals, the label óanimalô is a higher order concept than ómammalô.

However, the processing time of these two may differ not so much because of their semantic distance but the degree of familiarity of use, or in some respects their ótypicalityô. Malt and Smith, (1984). reported that processing time was also found to be related to the degree of typicality of a conceptual stereotype that an object possessed. On this basis, the term óanimalô is probably found to be in more common usage than ómammalô.

Another aspect that might account for differential processing time is the degree to which things are experienced and encoded in memory by their perceptual or functional attributes. Where a question is focused on the perceptual attributes of an object and the individual has ‘encoded’ the object by its functional attributes, there is possible delay or error in supplying the answer (Tabossi, 1996).

Summary comparisons of the Total Data collected from the research sample

The data files created by the CSA software, as mentioned above, were imported into spreadsheets for analysis. Three separate samples were collected, which in total provided 159 sets of data after the removal of duplicate data sets. The first sample was analysed for information on the Verbal/Imager dimension only since this aspect of communication was more clearly linked to the kinds of delivery styles (Visual/Verbal) sampled by the Preferences Questionnaire.

In the first sample, the students providing CSA data included not only Divisional Command Course students but also Control Officer Course members. As this data was collected in the very early stages of the research project, the information was only examined in terms of the CSA categories and the types of students used as subjects. There was, however, a noticeable difference in CSA profiles between the Control Officers and the Divisional Command students. Amongst Control Officers the predominant type was Analytic Bimodal, (almost 32%). Between 10% and 15% were fairly evenly distributed along the Wholistï Analytic dimension as ówholisticï imagersô óintermediateï imagersô and óanalyticï imagersô. Along the same dimension between 5% and 10% were Verbalisers, but 0% were Intermediates.

As the sample size of the Control Officers at that stage was relatively small, no further analysis was carried out. The later samples of additional Control Officer students were insufficiently large to continue studying the CSA profiles of different officer groups in this research study. The majority of the Control Officers were female but, due to the small numbers overall, no conclusions could be drawn

regarding the sex differences and their relationships to CSA type profile and processing speed. These data were not analysed further.

The number of complete data sets in this part of the research study was finally based on 174 studentsô responses.

The main area of interest rested on the response times recorded on the óverbalï imagerô dimension. Table 7:1 shows the average response times in 100ths of a second (the standard deviations are shown in brackets) for the whole sample, this includes students who were on courses other than the Divisional Command Course. The verbal and imager items are tabulated separately. The table also shows the longest and shortest response times for each group

Table 7:1 Mean processing times ***(in hundredths of a second)*** **for Verbalisers and Imagers – for items on the Verbal/Imager dimension**

	Verbal items				Imager items			
	Verbalisers	Bimodals	Imagers	All types	Verbalisers	Bimodals	Imagers	All types
Mean (SD)	584 (1707)	502 (1129)	609 (1288)	567 (1417)	436 (357)	386 (312)	442 (435)	423 (373)
Longest	32137	24831	25418	32137	6551	8091	8067	8091
Shortest	71	103	103	71	87	92	16	16
Range	32066	24728	25315	32066	6464	7999	8051	8075

(Data taken from spreadsheet CSASAMPT.XLS – VI-data-2 – p.13: See Appendix 3)

Due to the presence of some extreme values in processing times that probably skew the means unduly, the data in the following table (Table 7:2) shows the Median values so that comparisons can be made and they also may represent a more realistic figure. The effect of the extreme values mainly affects the Verbaliser items.

Table 7:2 Median processing times ***(in hundredths of a second)*** **for Verbalisers and Imagers – for items on the Verbal/Imager dimension**

	Verbal items				Imager items			
	Verbalisers	Bimodals	Imagers	All types	Verbalisers	Bimodals	Imagers	All types
Median (SD)	365 (1707)	334 (1129)	391 (1288)	363 (1417)	346 (357)	323 (312)	351 (435)	341 (373)
Longest	32137	24831	25418	32137	6551	8091	8067	8091
Shortest	71	103	103	71	87	92	16	16
Range	32066	24728	25315	32066	6464	7999	8051	8075

(Data taken from spreadsheet CSASAMPT.XLS – VI-data-2 – p. 14: See Appendix 3)

Looking at this data overall, it can be seen that subjects of all types on the Verbaliserï Imager dimension take longer to process Verbal items than the Imager items. If one considers the means rather than the median values for the groupings, there appears to be about 1 ï 1.5 seconds more time required to process a Verbal item as opposed to an Imager item. (Using the median values, the difference is about 0.22 of a second.) There is also a greater variation in the response times for verbal

items than imager items; for all verbal items SD 1417.2 (range 32055.0), compared with Imager items SD 373.5 (range 8075.0).

This differential between the processing times is the main basis on which the CSA instrument analyses an individualôs type on the óverbaliserï imagerô axis and therefore the results are not surprising.

Since these findings were not unexpected, focus of attention was then turned towards the processing speeds recorded for individual questions. It was at this stage in the analysis that it was noticed that one of the óverbal/imageryô questions appeared to take appreciably longer to process.

There did not appear to be any particular reason, from an examination of the item content, that could account for this apparent anomaly; but, some further details and hypotheses will be introduced later in the chapter.

As it was thought possible that the first sample data might be untypical, a further sample was analysed. The data in the second sample followed a similar pattern to the first sample, particularly in relation to the specific question identified during analysis of the first sample. A third sample was then taken, thus making a total sample of 174 sets of data.

There are unexplained circumstances to account for 11 responses to a single question (15) that exceeded 20,000 hundredths of a second. The effect of these responses is disproportionately large on the means on the verbal items in that they add some 2

seconds to the means as compared with the median values. A comparison between the means and the median values for the ôimagerô items is on average less than 100 hundredths of a second.

A comparison of responses across the sample as a whole, it is noticeable that ôimagersô take longer to process both verbal and imager items than do ôverbalisersô and ôbimodalsô. One hypothesis that might explain this difference in response times, but would require further research, is that the response times for verbal items depend on the ô*conceptual or semantic distance*ô between the pairs of words used and the higher order concept that links them. The response time would also appear to depend

on the speed of availability of higher order concepts, or the type of mental models available. (Collins & Qillian (1969), Malt and Smith (1984) and Tabozzi, P. (1996) p.19ï 34; in Oakhill and Garnham (1996))

Another reason might be that ôverbalô items, are qualitatively different from ôimagerô items in terms of the processing power required to respond to them, and therefore response times are quantitatively different. The former require the respondees to have a variety and range of higher order concepts available, whereas the latter require discrimination on only one attribute, namely colour.

Though colour is a highly visible attribute, and readily understood (except perhaps by people with colour blindness), one might question whether colour adequately represents the range of visual attributes that *imagers* use?

In order to clarify this matter as to whether colour adequately sampled the visual representation aspects in the CSA instrument, some further information about the origins and standardisation of the instrument was requested[1]. The response given was that during the development phase of the CSA instrument other attributes of a óvisualô nature, e.g. ósizeô, were sampled in the trial versions of the software. However, out of the range of visual attributes used in the questions, colour was found to discriminate more highly than the other attributes. Therefore questions sampling other visual attributes that were found not to discriminate between óverbalisersô and óimagersô were removed from the final selection.

A further question that arose from this data was, why do óverbalisersô appear to be able to process óimagerô items slightly faster than óimagersô despite having to process information in what is presumably their non-preferred or weaker modality? One possibility is that the óimagerô items are presented in a verbal mode (i.e. their preferred mode) but also require processing at a visual level.

Let us look now at the response times of respondees but this time according to their type on the ówholistï analyticô dimension. Table 7:3 shows their response times to verbal and imager items. Although in the initial studies of the relationship between the ówholistï analyticô and óverbalï imagerô dimensions show a near zero correlation.

[1] Information from Dr Richard Riding

Table 7:3 Mean processing times *(in hundredths of a second)* **for Wholists and Analysts – for items on the Verbal/Imager dimension**

	Verbal items				Imager items			
	Analysts	Intermôs	Wholists	All types	Analysts	Intermôs	Wholists	All types
Mean (SD)	633 (1698)	476 (731)	363 (516)	567 (1417)	448 (381)	396 (388)	309 (151)	423 (373)
Highest	32137	18840	6717	32137	8091	8067	1346	8091
Lowest	71	103	109	71	16	93	92	16
Range	32066	18737	6608	32066	8075	7974	1254	8075

(Data taken from spreadsheet CSASAMPT.XLS – VI-data-2 – p. 13: See Appendix 3)

Due to the presence of some extreme values in processing times that probably skew the means unduly, the data in the following table (Table 7:4) shows the Median values for comparisons to be made. The effect of the extreme values mainly affects the Verbaliser items.

Table 7:4 Median processing times *(in hundredths of a second)* **for Wholists and Analysts – for items on the Verbal/Imager dimension**

	Verbal items				Imager items			
	Analysts	Intermôs	Wholists	All types	Analysts	Intermôs	Wholists	All types
Median (SD)	389 (1698)	334 (732)	275 (517)	363 (1417)	367 (382)	307 (388)	279 (152)	341 (374)
Highest	32137	18840	6717	32137	8091	8067	1346	8091
Lowest	71	103	109	71	16	93	92	16
Range	32066	18737	6608	32066	8075	7974	1254	8075

(Data taken from spreadsheet CSASAMPT.XLS – VI-data-2 – p. 14: See Appendix 3)

From this data, it appears that ówholistsô have slightly faster processing times compared with óanalystsô on both óverbalô and óimagerô items. It is interesting to note that the average processing speed for óintermediatesô was not faster on 'verbal' or óimagerô items as compared with both óanalystsô and ówholistsô; unlike óbimodalsô, who probably have the flexibility to process in either mode.

From this tabulation, on both óverbalô and óimagerô items, it can be seen that óanalystsô take longer to process the information used in the CSA instrument and this could probably be due to the tendency for óanalystsô to examine the problem situation in more detail and take more time to make decisions (Riding and Rayner 1998, p.121).

There were other differences between the response timings on the óverbalô items than on the óimagerô items. Probably the most noticeable aspect is the degree to which óanalystsô and ówholistsô differ in their processing speeds. Analystsô average processing times covered a range from 132 to 923 hundredths of a second on the

óverbalô items and a range of 132 to 3866 hundredths of a second on óimagerô items, whereas ówholistsô had a range of 153 to 387 hundredths of a second on óverbalô items and a range of 125 to 796 hundredths of a second on óimagerô items.

The difference in processing speeds for óintermediatesô is more equally balanced between the óverbalô and óimagerô items and the dispersion is not so great as for óanalystsô; this may be due to the point raised above.

Let us now look at the ówholistï analyticô items. This section shows a similar analysis of processing times. The items in the CSA instrument involve two types of question, (1) to judge whether a pair of geometrical figures were the same or different, and (2) to identify whether a single geometrical figure is contained within a more complex figure.

Table 7:5 Mean processing times *(in hundredths of a second)* **for Verbaliser and Imagers – for items on the Wholist/Analytic dimension**

	Wholist items				Analytic items			
	Verbalisers	Bimodals	Imagers	All types	Verbalisers	Bimodals	Imagers	All types
Mean (SD)	434 (352)	456 (513)	430 (215)	440 (378)	277 (159)	282 (214)	279 (89)	279 (378)
Highest	1670	2183	1068	2183	1072	1046	647	1072
Lowest	108	103	110	103	108	100	101	100
Range	1562	2080	958	2080	964	946	546	972

(Data taken from spreadsheet CSASAMPT.XLS – WA-data-2 – p.11: See Appendix 3)

Table 7:6 Mean processing times *(in hundredths of a second)* **for Wholists and Analysts – for items on the Wholist/Analytic dimension**

	Wholist items				Analytic items			
	Analysts	Interms	Wholists	All types	Analysts	Intermôs	Wholists	All types
Mean (SD)	514 (67)	344 (304)	172 (67)	440.0 (378)	290 (376)	273 (304)	206.5 (67)	280 (378)
Highest	2183	1347	342	2183.0	1072.0	867.0	413.0	1072.0
Lowest	148	132	103.0	103.0	100.0	108.0	101.0	100.0
Range	2035	1215	239.0	2080.0	972.0	759.0	312.0	972.0

(Data taken from spreadsheet CSASAMPT.XLS – WA-data-2 – p. 11: See Appendix 3)

Whilst the measurement of processing speed is fundamental to the CSA instrument and the classification of cognitive style type (as in Table 7:6), it is interesting to note that there is not a large difference between the mean response and processing time between óverbalisersô and óimagersô on the ówholistï analyticô questions (Table 7:5). This would tend to confirm the view that the óverbaliserô-ï imagerô dimension is independent of the ówholistï analystô dimension.

A further question that arose during the research was óto what degree does processing speed relate to other measures of style, for example learning style as assessed by the LSQ?ô This will be examined in the next section.

LSQ Types and processing speeds

Out of the total data collected, some 83 paired sets of data (CSA and LSQ) were available for analysis. It was difficult to pair up the remaining sets since subjects, particularly early users of the CSA, used pseudonyms when logging on. Although the quantity of data was reduced, it was possible to obtain a limited picture of the relationship between LSQ type and processing speed. A decision was taken to look at the extreme groups from each of the LSQ types. These were designated *Hi* and *Lo* groups. The *Hi* group comprised the LSQ scores that were allocated to the Strong/Very Strong and the *Lo* group to scores with Low/Very Low classifications.

Tables 7:7 and 7:8 show the Mean processing speeds for the four LSQ types on the CSA Wholist/Analytic dimension and the Verbaliser/Imager dimension.

Table 7:7 LSQ Mean response times on Wholist/Analytic dimension

LSQ group	Activist		Reflector		Theorist		Pragmatist	
Wholist/Analytic	**W**	**A**	**W**	**A**	**W**	**A**	**W**	**A**
Hi-group (LSQ)	540	323	498	326	498	311	485	311
Lo-group (LSQ)	469	317	401	269	531	304	394	268

Table 7:8 LSQ Mean response times on Verbaliser/Imager dimension

Verbal/Imager	Activist		Reflector		Theorist		Pragmatist	
	V	**I**	**V**	**I**	**V**	**I**	**V**	**I**
Hi-group	523	411	609	432	605	423	540	407
Lo-group	662	420	516	393	635	443	702	428

These results show some differences in processing speed between LSQ types but only on the verbally orientated questions.

Earlier in this chapter it was proposed that ôactivistsô may be more ôimpulsiveô and therefore may react to the questions faster than other ôlearning styleô types. An examination of these two tables does not appear to give a clear answer to this hypothesis. On the ôwholistï analyticô questions there is no immediately apparent relationship between mean processing time and ôlearning styleô type. Activistsô responses to the ôverbalï imagerô questions on the other hand do show some faster response times as compared with other types, e.g. Hi-group activists and both verbal and imager style questions. Hi-activists appear to process verbal questions about 21% faster than Lo-activists. On ôimagerô questions the difference is not so great, 0.08 of a second difference.

It might be expected that high ôreflectorô type would take longer to process information. On verbal questions the difference between the Hi- and Lo- group means is 0.94 of a second, i.e. ôHi-reflectorsô take 18% longer than ôLo-reflectorsô.

The largest difference in mean processing speed for ôverbalô questions appears to be for ôpragmatistsô; the mean for ôhi-pragmatistsô is 1.63 seconds faster than for ôLo-pragmatists (some 23% faster). The difference between the Hi- and Lo- group response times was found to be significant (p=0.047).

Overall, the ôactivistsô and ôpragmatistsô show a tendency to respond slightly more rapidly than the ôreflectorsô and ôtheoristsô; although they are not statistically significant. Further research would be necessary to explore why these differences exist. Could it be that ôreflectorsô and ôtheoristsô have a more elaborated concept storage structure and thus require more retrieval time?

Anomalous findings related to questions

The details of response timings recorded on the spreadsheet were visually examined for any anomalies. One of the unexplained results related to response times to question 15. The response times for this particular question appeared to be much longer than for other questions; something which had not been found in data from other research group studies.

It was decided to analyse further samples of students using the CSA instrument. A further two samples, 180 and 159 respectively, were taken from data files. Careful examination of this data was carried out so that any duplicate data from earlier samples were removed. The findings from these samples, however, indicated a similar trend.

It was decided to discuss the particular question with fire service officers about the concepts involved in the question. Discussions failed to point to anything that could have led to this consistent need for longer processing of the question. Further hypotheses about the longer response time, such as a group going out for a coffee-break, or individuals going out for a comfort break were discounted since the same phenomenon occurred across different course groups.

The cause of this phenomenon has not been identified but might have an explanation in the possible ósemantic distanceô reasons mentioned above.

Summary

This chapter reports on a sub-study carried out within the research, namely to examine response time data and relationships with ócognitive styleô and ólearning styleô. The gathering and processing of the data are described as are the two reasons for exploring the data; firstly to seek quantitative evidence that LSQ óactivistsô are more óimpulsiveô than other groups, and therefore may exhibit faster response times, and secondly to uncover reasons that might explain the much longer processing times linked to one particular question.

The findings related to the óactivistô ï óimpulsivenessô hypothesis does seem to have some, but not conclusive, evidence particularly in relation to 'activists' and óverbaliserô focused questions; but there appears to be no clear relationship between 'activists' and other types of questions, e.g. óimagerô and the ówholistï analyticô problems. There do not appear to be clear differences in processing speed between the other LSQ types.

The problem related to long response times to a particular question was not resolved or otherwise explained and hence would require some further research if results gathered in the future exhibited the same characteristics.

CHAPTER 8

Discussion and conclusions

Overview

This chapter will review the findings of the three main aspects of the research in order to draw together the main themes and compare the outcomes with the original objectives. One of the objectives of the research was to study the degree to which scores on the CSA and the LSQ related by conducting a correlational study. A second objective was to examine the descriptors (constructs) used in the CSA and LSQ manuals through a factor analytic study of the three instruments in the hope of casting more light on the process of interpreting the scores from these instruments. Thirdly, to provide some answers to the question, ôhow far do these instruments provide information that can be useful in the design of courses that cater for studentsô learning style, cognitive style and preferred methods of being taught?

Discussion

The rationale of this research has been to examine some of the factors that can have some effect on the teaching learning process. Throughout this research it has been noticeable that there are many models and theories of learning, teaching and theories of cognitive functioning.

The plethora of models is an interesting phenomenon in itself since it gives credence to the view that one of the human behaviour responses to the world is to simplify information wherever possible into some kind of structure and classification and to encode stimuli in a verbally symbolic or visual model.

The visual ï diagram, or verbal ï metaphor, or mechanical ï analogue ï provide ways of encapsulating complex abstract ideas and relationships. Such constructions are a means of reducing cognitive complexity and are often capable of communicating what would otherwise take many words to describe. A familiar example of the mechanical analogue is that of the standard clock face. Its very familiarity caused few people to think about its elegance as a means of communicating the complex relationships of time. The digital display clock, popular during the last decade or two, has highlighted the fact that the additional information is conveyed by the traditional clockface, but is absent in the digital display. For example, questions such as óhow much longer?ô óhow much time is there left?ô are more easily estimated from a traditional analogue clock face than from a digital display.

In psychology, the development of theoretical models and structures attempt to communicate something more than mere words would do. In this research, the example of the óonionô model is used as a metaphor by which it is easier to understand the interrelations of cognitive functioning.

If one was to study a óneuroanatomyô text, it would soon be apparent that the brain just does not function in the way that the óonionô model proposes. However, as a

metaphor, the ideas associated with the ólayersô do suggest some of the attributes regarding the degree of accessibility as to how the brain functions. The idea that the outer layer is much more accessible than the inner core relates well to the idea that outward behaviour is much easier to observe than the neuronal activity deep inside the brain.

An alternative model, or framework, which comprises five levels, is summarized by Posner and Raichle (1997) and illustrated in the table below (Table 8:1)

Table 8:1 Framework for linking Cognitive and Neural Levels of analysis

Level	Example	Methods
Cognitive system	Language, attention, motor control	Verbal report
Mental operation	Next, rotate, zoom	Computer simulations
Performance domain (pathway activation)	Facilitate, inhibit	Cognitive studies, neural networks
Neural system	Parietal lobes	PET, event-related potentials, MRI, lesion analysis
Cell	Primary visual area	Cellular recording

These five levels describe a wider range of cognitive functioning, and provides a somewhat greater detailed view than the óonionô model by Curry.

The utility of the óonionô model in this current research is that it provides a simple structure into which the data gathered by each of the instruments, the CSA, the LSQ and the Preferences Questionnaire can be seen to relate. The three main layers in the model are described as follows: the innermost layer (or core) is responsible for ócognitive aspects of personalityô, the intermediate, or middle layer is responsible for óinformation processingô and the outer layer, which is the area of perceptual inputs

and reactional outputs, is related to such things as the learning situation and óinstructional preferenceô.

This metaphor, which attempts to describe what appears to happen in terms of brain functioning might, with the passage of time, appear to be as strange to future cognitive researchers as does present knowledge about our planet when compared to the believers of a óflat earthô. However, until a more sophisticated model is devised, let the existing ones communicate what they can.

In the current research the three assessment and survey instruments described earlier have been used to sample behaviour from each of these ólayersô. These are: the CSA, which appears to sample the inner and middle layers. The constructs used in the CSA descriptors include aspects of both personality and learning strategies (Riding and Rayner 1998, p.83). The data described in the current research regarding processing speeds casts some light on the differential quantitative aspects of óinformation processingô, namely differences in processing speed between those who see things ówholisticallyô as compared with those who see óanalyticallyô, and similarly those who encode the in a óverbalô or óimageô form for processing.

The LSQ, on the other hand, primarily samples ópreferencesô for learning behaviours. To a lesser extent the descriptors in LSQ analysis have some links with secondary aspects of personality. Some of the research examined in earlier chapters link LSQ descriptors with secondary aspects of the core personality traits in the óbig threeô and the óbig fiveô.

The ôPreferences Questionnaireô used in the research was designed purely to sample the ôsurfaceô elements of individual preferences for the delivery of training. The LSQ and the Preferences Questionnaire would, in Curryôs model, sample the outer layer of learning preferences; in fact these might be considered as perceptual process preferences since it could be argued that this level of functioning is at the interface between the individual person and the environment, i.e. the learning context.

The aim of this research design has been to take a broader look at the use of the two assessment instruments that sample cognitive and learning styles in order to examine possible relationships between them and also to see if there are links between cognitive and learning styles and how individuals prefer material to be delivered for learning.

The CSA has been used in a number of research studies (Riding and Rayner, 1998) much of which has focused on quantitative aspects; e.g. correlations between cognitive style and improvements in learning (Riding and Sadler-Smith, 1992) as well as other aspects of ability and personality. The use of the LSQ has generally been reported in qualitative research studies focusing on how individuals and groups of individuals learn (Mumford, 1993, 1994 and 1995).

One of the major difficulties regarding learning style and cognitive style research, and their links with personality, is that of the meanings of ôconstruct namesô and how they are sampled by each instrument. This is a particular problem when the same labels are used in different instruments. Whilst it is possible to correlate findings with other instruments that use the same labels, it is not always possible to ensure

that there is a similarity of meaning concerning the qualitative aspects attached to a label.

There is a possible line of debate as to whether the constructs used in Kolbôs model of óexperiential learningô, which is a model of the learning process, are appropriate for use as a model of ólearning styleô; as used in the óLearning Styles Inventoryô. There is also a similar case to be made about Honey and Mumfordôs use of this model as an assessment model for the óLearning Styles Questionnaireô, despite using different construct names.

The main question arises as to whether models of the learning process are considered as being in parallel with, or are a reflection of the processes involved in student learning; in much the same way that Ausubel discusses how theories of learning and of teaching are really independent of each other; though one can draw inferences from one to explain the other.

Whereas Ausubel identifies a range of cognitive skills and processes (intrapersonal and situational) that are used in learning different types of subject matter, the ólearning cycleô models of Kolb, and Honey and Mumford, describe fewer, but more generalised processes, all of which are used to a greater or lesser extent by learners.

The learning style of an individual, when described in terms of the learning cycle model, is shown as a profile of an individualôs óstrengthsô and óweaknessesô in using each of the four main processes of the learning cycle. The theoretical óroundedô learner presumably has equal strengths in each of the four dimensions. A low score in one or more of these dimensions is thus considered as a deficit that can be

remediated through training. It might also be necessary to consider the ôintrapersonalô, ôinterpersonalô and ôsituationalô aspects of the learning environment and how they affect each of the four areas of the learning cycle model.

The complexities involved in describing how learning takes place depend on ôwhat has to be learnedô, ôwhat is already knownô, and ôhow something can be learnedô. It would appear that an individual needs to have a balanced profile to be a ôroundedô learner; and anyone with a skewed profile would be a less efficient learner. This notion would reflect the suggestions of Pask (1976), who considered that individuals who are able to switch from mode to another when learning become more flexible and efficient learners.

Instruments such as the LSQ and the CSA have been shown to indicate some significant correlations with particular learning activities in controlled ôlaboratoryô (classroom) situations. However, the range variables in normal classroom situations would produce research results and conclusions which at the most should be considered tentative.

The need to apply an element of caution in generalizing results of psychological experiments such as these is also supported by Tennant (1997, p.136) who, whilst agreeing with the principles of research methods in controlling for unwanted variables, nevertheless points out that application of such findings in the 'real' world is not subject to such controls.

Returning to the problem of constructs, it has not been possible in this research study, due to lack of studentsô and teaching colleaguesô time, to undertake an

examination of the CSA scores with other instruments that have a more extensive background of research studies to support them; such as the MBTI and 16PF. Had this been possible, the data gained could then have provided some benchmarks about the CSA and LSQ, particularly in accounting for the personality aspects of style.

Instead it has only been possible to make some tenuous links through some other research into the correlation between the EPQ (Eysenck Personality Questionnaire) and the LSQ by Furnham *et al* (1997). This research identified a correlation between the LSQ ó*activist*ô and the EPQ ó*psychotic – impulsive*ô trait. Since in the current research it was found that the ówholistï analyticô dimension of the CSA correlated negatively with the LSQ óactivistô dimension, it would be possible to consider that high óactivistô scores tend to be associated ówholistsô with low WA ratios. The number of ówholistsô in the sample was small and therefore the findings were not statistically significant.

CSA descriptors used in reporting ówholisticô behaviour in the form of personality traits are stated to be ómoderatedô by a degree of óverbaliserï imagerô interaction. For example a ówholistï verbaliserô in response to difficulties is described in one of the descriptors as,

> ñWhen things get difficult and you are under pressure or stress you tend to become more outward and active. This can be a positive characteristic since this outward energy may help to resolve the difficulty.ò

However, a ówholistï imagerô in response to difficulties is described as,

> ñYou tend to become more inward when things are difficult. You withdraw into yourself.ò.

The qualitative differences in personal response behaviour described here appear to

be influenced by the degree of óverbaliserï imagerô tendency; and yet correlations between this CSA dimension and the four LSQ types are all less than 0.03 (range r=0.005 to r=0.031).

The relative 'extraversion' aspect of 'activists' behaviour and the relative 'introversion' of 'reflectors' would also appear to suggest that there might be some subtle differences in the qualities of the constructs being measured by both these instruments.

The descriptors in the LSQ manual for óactivistsô appear to imply that they learn best when they are faced with novel activities, activities that set a challenge and involve excitement and drama. Other examples exist in the descriptors that suggest that the CSA dimensions and the LSQ types lie across each other (orthogonally) rather than have any direct relationships.

Apart from the low correlations between the CSA ratios and the LSQ scores in the current research, the apparent lack of published quantitative data, other than that of Furnham, *et al* (1997), makes further quantitative comparisons difficult. There appears to be a pragmatic utility in applying the four styles of the LSQ, since it is described in the many qualitative studies of training for developing managers. In this respect, the LSQ is perhaps more useful for descriptive purposes in the process of arousing individual awareness than as a research instrument.

The current research, however, seems to confirm other research findings concerning the number of factors present in the LSQ. For example, Allinson and Hayes (1990), report two main factors; one which is ó*action*ô focused, and the other ó*analysis*ô

focused. In the current research, however, the two factors identified appear to be ó*reflector*ô and ó*pragmatist*ô focused; or they might be labelled ó*thinking*ô and ó*doing*ô.

First impressions of the LSQ instrument would suggest that the óactivistô style would form the basis of the óactionô focused factor. However, from the current research findings the óactivistô style was highly negatively loaded on the 'thinking' (or reflector) factor (r= ï 0.82) and it had almost no correlation with the 'doing' (or pragmatist) factor (r=0.09). On the óthinkingô factor, óreflectorsô loaded highly (r=0.84) and ótheoristsô slightly less so (r=0.71); the ótheoristsô also correlated almost equally with the ódoingô factor (r=0.62).

This would seem to imply that individuals with a ótheoristô style would not only think about something but also do something. The descriptors in the LSQ manual suggest that ótheoristsô learn best from situations that are logical, systematic, well organized and offer opportunities to reason rationally.

The general findings in this research tends to support a view that the two CSA factors (ówholistï analyticô and óverbaliserï imagerô) and the two basic LSQ factors (óthinkingô and ódoingô) are not immediately related and would thus lie orthogonally in an imaginary conceptual space.

A similar problem concerning the conceptualizing of construct statements arose during the research when gathering the data using the questionnaire designed to identify student preferences for course delivery. The dilemma that had to be faced had some practical implications.

It was important to design a form that was not too time consuming to complete and yet it also had to yield sufficient information for analysis. If the questionnaire had been lengthy and items more tightly defined and specific, there would have been a possibility that a fewer number of questionnaires would have been returned. In the event, the shorter questionnaire had a satisfactory return rate, over 80%.

However, one of the defects was that some of the items in the questionnaire could possibly be given a wider interpretation than was intended. For example, the item ó*Listening to the lecturer talking*ô although if it is taken literally, it is specific, it could ï and probably was ï interpreted as ó*listening to a lecture'*. In the interpretation of the term ólectureô, various other meanings related to presentation could have been encapsulated within an individualôs response. Therefore, this wider interpretation might have influenced an increase or decrease in the degree of preference and helpfulness felt by the respondee. As many of the lectures given at the College are designated óinteractive lectureô it is possible that this wider interpretation was intended in some responses.

Another problem experienced, described briefly in chapter 6, was that in order to give the questionnaire a degree of priority over those being devised by fellow students for their own study projects, the questionnaires were used as an evaluation form about a particular session on their course. Due to the organization of the course, this meant that certain kinds of delivery were not included within the programme, and therefore some of the items on the questionnaire were marked N/A as they were not applicable. This inevitably meant that certain items on the questionnaire were left

blank and thus provided less data than for others.

Later cohorts of students received amended instructions requesting them to give their preferences regardless as to whether particular delivery methods were used on the course. Students were asked to remember their previous experiences on earlier courses to help them work out their preferences.

Once sufficient data had been collected, i.e. from in excess of six student cohorts (>140 students), the analysis was carried out in two ways, firstly the raw data was analysed visually through tabulating the data in spreadsheets, secondly, this raw data was exported from the spreadsheets and imported into the SPSS package for more complex analysis such as óanalysis of varianceô and ófactor analysisô. Analysis of the data from the earlier cohorts did not reveal any noticeable results in terms of associations or any visible patterns.

As data accumulated, this trend did not change appreciably. The introduction of some data from another source, namely business studies students from a Higher Education institution enabled some comparisons to be made. Analysis of both sets of data revealed that the profile of Fire Service College students was atypical by comparison. The spread of ratio scores for the HE students was fairly equally distributed across the nine CSA categories. A Log-Linear (non-parametric chi-square) analysis of the two sets of data identified a highly significant ($p<0.001$) difference in scores. The relative homogeneity of the FSC student sample, i.e. a predominance of óanalyticsô, therefore made comparisons between learning types and cognitive style somewhat difficult since there was insufficient differentiation

within this sample group with regard to CSA scores on the ówholisticï analyticô dimension.

The range of ratio scores on the óverbaliserï imagerô dimension for both sample groups were more evenly distributed across the CSA categories, although there were slightly more subjects in the óimagerô category of the dimension for the HE student sample as compared with the FSC group, which showed a more even distribution.

In view of the ómoderatingô influence of the 'verbaliserï imager' dimension on the ówholistï analyticô axis, the descriptors suggesting that aspects of óintroversionô increase in relation to increases in óimagerô scores. It is therefore possible to infer that the HE students exhibit a slightly more introverted style of behaviour as compared with the FSC students.

Quantifying and comparing more accurately the degree of óintroversionô between the two sample groups has not been possible since no independent measures of this trait were available. However, some historical data, which was gathered from Divisional Command Students at the FSC over a period of ten years prior to the current research was made available. This data, using the Myers-Briggs Type Indicator (MBTI), indicated that DCC groups sampled tended to have a profile of scores slightly weighted on the side of óintroversionô (Introversion groups = 55.5%, Extraversion groups = 44.5%). This distribution closely parallels the DCC sample distribution across the óverbaliserï imagerô categories in the following percentages: óverbalisersô = 30.7%; ôbimodalsô = 33.1% and óimagersô = 36.2%. This compares with the HE students: óverbalisersô = 29.4%; ôbimodalsô = 30.6% and óimagersô = 40.0%.

Before looking at the relationships between cognitive style, learning style and preferences for methods of course delivery, it is perhaps useful to look at the implications of the factor analysis carried out on the questionnaire data.

Early in the research some exploratory work using personal construct elicitation techniques identified some of the perceptions students had about the methods of course delivery at the FSC. Though a full statistical analysis of this small scale study was not pursued, some of the concepts and constructs produced by the students were used in the construction of the Preferences Questionnaire.

After the questionnaire data was gathered in and entered into a spreadsheet, some of the original constructs from the pilot study were used to form labels for a grouping of the delivery methods listed on the questionnaire. For example ópassiveô, óactiveô, óhands-onô and óinteractiveô formed the basis for reducing the 14 items into a more manageable six. As this was an intuitive classification used in the middle stages of the research, this classification was discarded when the factor analysis identified more statistically justifiable domains. The analysis of the ópreferenceô data was then carried out using the five factors identified.

The five factors were labelled, óhighly practical and interactiveô, óabstract, academic and non-interactiveô, ólecturer directed interactiveô and óuse of video ï moving imagesô. These proved to be similar categories to those used óintuitivelyô earlier on. From this analysis it was possible to identify broadly what students preferred and what they found helpful in the way of course delivery methods.

The questionnaire itself was sampling studentsô views on the delivery systems as

they existed at the Fire Service College at the time of the research. It would have been possible to include other methods of delivery, even though they were not used at the College. These might have elicited preferences for methods that students may have experienced at other institutions or establishments.

It could be argued that this wider representation of delivery systems could be useful to any organization wishing to review options for designing future courses. This could well provide a topic for further research.

One of the original aims of the course was to inform College teaching staff about optimising the design of courses for students at the College by using the information about cognitive and learning style of the students. In view of the complexities of learning environments and the interaction of individuals with these variables, there is a considerable problem in defining the criterion of ôoptimalô in relation to course design and how to evaluate it.

Looking at it from a studentôs perspective, the data gathered has identified their preferences for various delivery methods and also how helpful they are to their learning. However, looking at the situation from the College authorityôs perspective, the term ôoptimalô would most probably be equated with ôlowest cost optionô. Somewhere in between these two lies the need to consider ôefficiencyô and ôeffectivenessô, which might imply using some less preferred methods of delivery to reduce costs but at the same time encouraging students to become more effective learners by encouraging them to engage in new strategies of learning.

Efficiency is presumably the ratio of ôlearning effectivenessô divided by ôcostô. A

cheap solution may not be effective and therefore not efficient, conversely a more expensive solution may be far more effective and thus more efficient.

Suffice it to say, the data gathered in this research has given some useful pointers in terms of the general direction future course development should pursue. These findings, summarized below in the conclusions, have recently been substantiated by information gathered from course evaluation sheets over the past year that have identified some of the weak areas of course delivery. Some further suggestions were given about alternative course delivery methods, which coincidentally is in agreement with the delivery preferences indicated by this current research study.

Conclusions

The overall aim of the research was use data gathered about studentsô preferences for methods of course delivery and then to use the data to assist in designing courses using an optimum balance of delivery methods. Also, the research aimed to examine the utility of the Cognitive Styles Analysis instrument, the Learning Styles Questionnaire as methods for identifying studentsô preferred learning style.

The use of the concept óoptimumô is linked with other concepts such as óefficiency and effectivenessô. In the field of training there are no simple answers to questions about efficiency. Whether it might be possible to cut the costs of delivering courses by increasing the time spent using preferred delivery methods remains in some doubt without further research.

Findings in this research indicate that the preferred methods tend to be the more

labour intensive ones, i.e. those requiring more tutor student interaction, more peer interaction, and more practical work. Other findings suggest that initially it may not be possible to engage in using distance-learning as a method to reduce costs, particularly in view of the low preference ratings given to areas of academic and self-study materials; and also the relatively expensive development costs.

The key will be to maintain or raise the effectiveness levels of students' learning through preparatory programmes in study techniques using the new technologies whilst at the same time either maintaining or reducing the costs elsewhere. The following quotation proposes a note of caution but supports the findings of students preferences for interactive learning,

> ñEducation is not reducible to the downloading of information, much less to the passive solitary activity of staring at a screen. Education is an intersubjective and social process, involving hands-on activity, spontaneity, and the communal experience of sharing in the learning enterprise.ò (Noble, 1998)

The findings using the CSA and LSQ scores appear to be inconclusive in providing direction towards optimising the delivery of courses. This is due to the number of factors that interplay within the teaching and learning process is large.

The highly skewed distribution of FSC students on the CSA ówholistï analyticô dimension makes predictions about the links between optimal course delivery methods and cognitive style inconclusive. Whereas one could be confident in stating that the most popular delivery methods are suited to analytics, the absence of a similar number of 'wholists' makes it difficult to state whether these same methods would, or would not, suit 'wholists'.

Where research has found links between both the CSA and the LSQ and favourable learning situations, the focus has tended to be on one or two controlled factors.

The overall findings indicate that there is little correlation between the CSA scores and the LSQ scores, the highest value reached being between the Wholist/Analytic dimension and Pragmatists (0.089). This would seem to indicate that the two instruments are assessing two qualitatively different areas of cognitive functioning. The LSQ assesses attitudes and situations of people and how they appear to learn best, whilst the CSA examines the type of processing that individuals undertake when receiving material to learn.

From the data gathered during the current research, neither instrument appears to help in identifying how individuals like to be taught since their preferences, indicated by the preference questionnaire, do not show a consistent pattern of correlation with either the CSA or LSQ.

What the research has shown substantiates previous findings about the CSA having two independent construct factors as very low correlation values were found between the ówholistï analystô and óverbaliserï imagerô dimensions (ï 0.43).

The factor analysis findings related to the LSQ data suggests that there are two main factors that can probably be best described as óthe thinkersô and óthe doersô. This would be broadly in line with earlier research that identified factors óactionô and óanalysisô; except that in this current research óthe doersô relate to ópragmatismô rather than the óactionô factor, which in previous research related to óactivistsô.

The óactivistsô dimension appears to be at the opposite pole of a construct dimension based on óreflection ï ?ô since it correlates highly negatively with this factor. A possible secondary trait that could possibly be associated at the opposite end of the bi-polar construct is óimpulsivityô. Since, according to previous research, the óactivistô style correlated with óimpulsivityô on the EPQ instrument, the current research would appear to confirm this finding.

These latter points will help to clarify some of the construct definitions related to cognitive and learning styles.

The CSA data gathered in this research shows a distinctive profile for this particular vocational group. The predominance of 'analytic' tendencies found in the sample may be due to the type of people selected for the Fire Service or it may be that the nature of the work has some moulding effect on those within the service and thus enhances the analytic thinking processes. A wider survey and further research would be required to confirm these hypotheses.

The general absence of relationship, or statistically significant correlations, between the Cognitive Styles Analysis instrument and other instruments used would seem to confirm the view that 'style', as measured by the CSA, exists as a separate entity. This will need to be explored further to address the questions indicated below.

Three major questions arise from the current research and would form the basis for future research projects.

1. On a specific note, is the sample of Divisional Command Course students in the current research typical of Fire Service personnel as a whole?

2. How far do the Cognitive Styles Analysis dimensions correlate with individual constructs, or factors, measured by other instruments measuring personality and ability?

3. Does 'style' form a bridge between core personality traits and outer manifestations of behaviour as reflected in preferences, strategies or abilities?

In answer to the first question, further data from a larger survey would need to be gathered. As far as possible, the data would need to be gathered from a wider range of personnel at all levels in the Fire Service to include firefighters, junior officers, senior officers and officers who work in control rooms.

In answer to the second, a large scale correlational data gathering exercise would need to be carried out using the CSA and a variety of other instruments that assess the 'big five' personality factors. The sample size would need to be large enough to allow for correlations with individual secondary factors to be carried out. Such a study would help to identify the links, if any, with the core traits and their subsidiary aspects.

The third question would need to address the reasons why the CSA has low correlations with both personality and preference factors. Research would need to explore what particular behavioural manifestations are uniquely linked to style but cannot be accounted for by other factors. In other words, firstly, find out what

cognitive style isn't, and then to define style through eliminating constructs which can be accounted for by other aspects such as personality and ability.

If style exists as a separate entity, then from such an examination of the gaps between personality and ability, or indeed any interactions between them, could be a basis for describing style operationally.

There are other instruments that purport to measure cognitive style. Each one assesses the style construct is a particular way. A correlational study between the CSA and other instruments could help to identify what factors are common and what are distinctive to the various instruments used.

Though it is possible to think wholistically or analytically for some of the time, is the degree to which individuals think in either mode a matter of style or is it related to context and experience. Are we restricted to thinking in general terms because we lack the knowledge, expertise or experience to perceive the detail?

The same uncertainty can be linked to the 'verbaliserï imager' dimension. The problem of encoding may not be related to style but to the material that requires encoding. Abstract concepts can be coded as ephemeral 'mental models' and discarded when no longer required in the process of thinking. Are these mental models then subsumed into the cognitive structure ready for use on a future occasion?

Whilst the 'wholistï analytic', 'verbaliserï imager' model of cognitive style provides the most coherent model of cognitive style to date, there is a need to explore some

further areas such as the process of encoding concepts. In particular how do the blind encode images and would they tend to be 'verbalisers'?

Research into the cognitive style profiles of vocational groups has so far (Riding and Rayner, 1998) not identified any particular groups that are predominantly 'wholistï verbaliser' or 'intermediateï verbaliser'. Further surveys may identify what kinds of groups they are; and are they 'doers' or 'facilitators' as predicted in the models of team roles?

Cognitive style research is still a relatively new area of exploration. The style jungle is still strewn with the debris of studies that have lead off into remote parts. A clearer view is ahead but there is still a mistiness obscuring the destination.

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Appendices

Appendix 1

Appendix 2

DCCCSAC2.XLS

Appendix 3

CSASAMPT.XLS

Appendix 4

THE FIRE SERVICE COLLEGE
MORETON-IN-MARSH ENGLAND

Teaching & Learning Styles Survey

About yourself

Name:

Date of birth:

Rank:

Student number:

Course:

Which statutory examinations have you passed? *(please ✓ in the box(es))*

a) Leading Firefighter ☐
b) Sub Officer ☐
c) Station Officer ☐

Other qualifications:

CSE ☐ GCE/GCSE(O level) ☐
HNC/Certificate ☐ HND/Diploma ☐
GCE (A level) ☐
Degree:
Other professional qualifications:

Professional memberships:

Notes:

Our teaching staff at the College are constantly looking at ways in which they can improve the delivery of our courses. This questionnaire is part of a data gathering exercise to discover student preferences when learning new information and skills.

We should like to ask you to spend a little time reflecting on a course session and to complete the information on the reverse side of this sheet showing what your preferences are and how much the methods used helped you.

The information will be treated in confidence; (results will be available to participants on request). Your name and student reference number will only be used to help us match up other data that you will be asked to give during the course.

Please return this questionnaire to the tutor who issued it for this session, or by internal post to:
Mr. E.L.Wilson - Educational Development Tutor - Room L128

Preferences Questionnaire on Course Delivery Methods

Please give your ratings for *each* of the delivery methods listed (whether used on your present course or not)

Of the course you are studying, how much did you know already?

Almost none of it	A little of it	About 50/50	A moderate amount	The majority of it

What are your preferences for each type of presentation method?
Tick ✓ boxes showing your preferences.

	Preferences						How much do these help you?		
	Strongly dislike	Dislike	No particular preference	Moderate preference	Strong preference		Very little help	Quite help-ful	Very help-ful
Listening to the lecturer talking.						1			
Looking at pictures/diagrams illustrating the concepts and principles to be learned.						2			
Watching 35mm slides, whilst listening to a commentary.						3			
Watching Video or film						4			
Demonstration using equipment/floorplans etc.						5			
Reading through course notes/books						6			
Writing notes & exercises about the topic						7			
Discussion with tutor						8			
Discussion with colleagues						9			
Working on simulated exercises/case studies						10			
Rôle play exercises						11			
De-briefing practical exercises using video						12			
Library study and researching information						13			
Using learning materials for study purposes						14			

Any general comment about the course delivery.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
1																																													
2				CSA							PrvKn		Preference																																			
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
4	1	0.00	0.00	0	00	00	00	00			0																																		
5	2	0.00	0.00	0	09	08	11	09			0																																		
6	3	0.00	0.00	0	05	15	13	09			2		3	2	3	2	2	1	4	1	3	2	1	1	3	2	4	3	4	3	4	3	4	3	4	3	3	2	3	2	3.80	2.33	2.67	3.50	4.00
7	4	0.00	0.00	0	00	00	00	00			0																																		
8	5	0.00	0.00	0	08	10	04	15			3																																		
9	6	0.00	0.00	0	08	19	14	18			4		3	3	3	3			3	3							3	3	3	3					3	3					3.00		3.00	3.00	3.00
10	7	0.00	0.00	0	08	14	15	13			4		4	2	4	2	3	1	4	2	4	2	2	1	3	1	5	3	5	3	4	2	4	2	4	2	5	3	4	2	4.20	3.00	4.00	4.50	4.00
11	8	0.00	0.00	0	11	10	12	13			5		3	3	3	2			3	3			3	3	3	2	3	3	3	3	3	3									3.00	3.00	3.00	3.00	3.00
12	9	0.00	0.00	0	08	13	09	15			3		3	3	3	2			3	3							3	3	3	3											3.00		3.00	3.00	3.00
13	10	0.00	0.00	0	05	19	14	15			3		3	3	3	2			3	3									4	3	3	2									3.50		3.00	3.00	3.00
14	11	0.00	0.00	0	05	16	12	13			2		3	2					3	3					4	3	3	2	3	3									5	0	3.00	4.50		3.00	3.00
15	12	0.00	0.00	0	02	13	14	13			2		3	3	3	3			3	3			3	2	3	2	3	3	3	3	3	3									3.00	3.00	3.00	3.00	3.00
16	13	0.00	0.00	0	09	16	13	12			1		5	3	4	3	4	3	4	2	4	2	3	2	3	2	3	2	4	2	5	2	4	2							4.25	3.00	4.00	4.00	4.00
17	14	0.00	0.00	0	13	15	12	16			3		4	2					4	2			3	2			4	2	4	2	3	2									3.50	3.00		4.00	4.00
18	15	0.00	0.00	0	08	19	14	18			3		3	3	2	2			3	3			3	2	4	3	3	2	4	3	3	2									3.50	3.50	2.00	3.00	3.00
19	16	0.00	0.00	0	08	16	14	10			2		3	2	3	2			3	3							3	2	3	3	3	3									3.00		3.00	3.00	3.00
20	17	1.80	0.76	1	00	15	15	13			2		4	2	3	1	3	2	4	3	2	1	2	2	2	2	4	2	4	2	3	2	2	1	4	3	3	3	3	2	3.00	2.33	3.00	4.00	4.00
21	18	1.52	0.81	1	09	12	13	14			0																																		
22	19	1.63	0.81	1	03	20	19	18																																					
23	20	1.20	0.81	4	05	09	10	09			0																																		
24	21	1.71	0.82	1	05	12	07	07			4		5	3	4	2	3	2	2	1	3	2	2	2	2	2	5	3	5	3	5	3	5	2	3	2	4	2	3	2	4.20	2.33	3.67	5.00	2.00
25	22	1.56	0.83	1	09	11	07	07			0																																		
26	23	1.93	0.83	1	12	14	10	15			0																																		
27	24	1.21	0.83	4	12	08	09	12			1		5	3	5	3									4	2			4	2							5	3			4.00	4.00	5.00	5.00	
28	25	2.05	0.84	1	08	17	11	12			0																																		
29	26	1.38	0.84	1	09	14	13	16			5		2	2	3	1	2	1	3	2	4	2	3	2	4	2	5	3	5	3	5	3	4	2	5	3	4	2	4	2	4.60	3.67	3.00	3.50	3.00
30	27	2.07	0.85	1	07	16	12	10			0																																		
31	28	1.64	0.86	1	06	14	17	13			1		3	2	3	2	5	3	4	2	4	2	4	2	5	3	3	2	4	2	3	2	2	1	4	2	4	2	3	2	3.40	4.00	4.00	3.00	4.00
32	29	1.05	0.86	4	15	14	11	17			2		5	3	4	2			4	3							4	3	5	3	4	3									4.50		4.00	4.50	4.00
33	30	2.13	0.87	1	06	14	15	10			0																																		
34	31	1.73	0.87	1	04	19	18	16			4		4	3	4	3	3	2	4	3	3	2	2	2	4	3	3	2	5	3	4	2	4	2	4	2	3	2	3	2	4.00	3.00	3.33	3.50	4.00
35	32	1.05	0.88	4	00	00	00	00			2		4	3	4	2	4	2	4	3	3	1	3	2	4	2	4	3	5	3	4	2	4	3	4	2	3	2	3	2	4.00	3.33	3.67	4.00	4.00
36	33	0.69	0.88	7	00	00	00	00			3		4	2	4	2			5	3			4	2	4	2					5	3									5.00	4.00	4.00	4.00	5.00
37	34	1.75	0.88	1	08	08	10	12																																					
38	35	1.74	0.89	1	06	14	10	15			4		3		3		3		4		4		2		2		4		4		4		5		5		3		3		4.40	2.33	3.00	3.50	4.00
39	36	1.84	0.89	1	00	00	00	00			4		4	2	3	2	1	2	4	3	3	2	2	3	4	3	4	3	4	2	4	3	2	2	4	3	4	3	3	2	3.40	3.00	2.67	4.00	4.00
40	37	2.40	0.90	1	05	19	15	14			0																																		
41	38	1.32	0.90	1	09	16	18	16			2		3	3					3	3							3	3	3	3											3.00			3.00	3.00
42	39	1.18	0.90	4	00	00	00	00			0																																		
43	40	2.38	0.90	1	08	13	11	15																																					
44	41	1.34	0.90	4	07	14	18	16			3		5	3	5	3					4	2	4	2			5	3	5	3	4	2	5	3	5	3			4	2	4.60	4.00	5.00	5.00	
45	42	1.03	0.91	4	13	09	11	18			3		3	2	4	2	3	2	4	2	4	2	2	1	3	2	4	2	4	3	4	2	4	2	3	2	3	2	3	2	3.80	2.67	3.33	3.50	4.00
46	43	1.59	0.93	1	06	17	14	11			4		5	3	3	2	3	2	4	3	4	3	2	1	2	1	5	3	5	3	5	3	4	3	4	3	2	1	2	1	4.40	2.00	2.67	5.00	4.00
47	44	1.23	0.93	4	00	00	00	00			0																																		
48	45	1.69	0.94	1	11	10	10	16			0																																		
49	46	4.74	0.94	1	00	00	00	00			0																																		
50	47	1.31	0.94	4	04	19	14	12			3		4	3	2	1	2	1	5	3	3	2	4	2	3	2	5	3	4	3	3	2	4	2	4	2	3	2	3	2	3.60	3.33	2.33	4.50	5.00
51	48	1.58	0.95	1	00	00	00	00			0																																		
52	49	2.69	0.95	1	05	16	10	14			3		5	3	3	1	2	1	4	2			3	2	3	2	4	2	5	3	4	2					3	2	3	2	4.50	3.00	2.67	4.50	4.00
53	50	1.80	0.95	1	10	12	08	11			4		5	3	5	3			5	3			2	1	3	2	4	2	4	2	4	2	2	1	3	2	3	2	3	2	3.25	2.67	4.00	4.50	5.00
54	51	1.98	0.95	1	09	09	13	18			4		5	3	3	1	3	1	4	2	2	1	3	2	4	2	5	3	5	3	4	2	4	2	4	2	3	1	3	1	3.80	3.33	3.00	5.00	4.00
55	52	2.26	0.95	1	05	14	09	08			3		5	3	4	2	3	2	5	3	3	1	2	1	3	1	5	3	5	3	4	3	4	3	3	1	3	2	3	2	3.80	2.67	3.33	5.00	5.00
56	53	1.29	0.95	4	05	19	12	12			4		2	1	5	3	4	2	5	3	4	2	2	1	3	2	4	2	4	2	5	3	5	3	5	3	4	3	4	0	4.60	3.00	4.33	3.00	5.00
57	54	1.26	0.95	4	09	12	13	17			5		3	2	5	3	3	2	4	2	4	3	2	2	2	2	4	3	4	3	4	2	4	3	4	3	2	1	2	2	4.00	2.00	3.33	3.50	4.00
58	55	0.74	0.95	7	08	16	13	14			0																																		
59	56	0.92	0.95	7	04	17	13	09			2		4	3					4	2			4	2	3	1	4	2	3	1	4	2					4	2	3	1	3.50	3.33	4.00	4.00	4.00
60	57	1.35	0.96	1	10	12	14	16			0																																		
61	58	2.33	0.97	1	05	04	09	15			0																																		
62	59	1.89	0.97	1	09	13	12	11			2		4	3	4	3	3	2	4	3	3	2	2	1	3	2	4	2	4	2	4	3	4	2	4	3	3	2	3	2	3.80	2.67	3.33	4.00	4.00
63	60	1.34	0.97	4	06	20	18	14			0																																		
64	61	1.00	0.97	7	13	17	15	17			0																																		
65	62	0.94	0.97	7	11	17	11	11			3		4	2	5	2	3	2	3	2	4	2	2	1	4	2	4	2	5	3	5	3	4	2	5	3	5	3	4	2	4.60	3.33	4.33	4.00	3.00
66	63	1.95	0.98	1	11	14	09	13			4		5	3	5	3	3	2	5	3	3	2	3	2	4	3	5	3	4	3	4	2	3	2	4	3	4	2	5	3	3.60	4.00	4.00	5.00	5.00
67	64	1.46	0.98	1							0																																		
68	65	2.09	0.98	1	13	05	08	15			0																																		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
69	66	1.76	0.98	2	08	14	12	16			2		4	3	4	2							4	2	3	2	5	3	4	3	4	2							3	2	4.00	3.33	4.00	4.50	
70	67	2.30	0.98	2	08	17	13	18			0																																	
71	68	2.02	0.98	2	11	13	07	12			0																																	
72	69	1.19	0.98	5	04	14	12	12			3		4	3	4	3			4	3			4	2	3	2	4	3	5	3	5	3									5.00	3.50	4.00	4.00	4.00
73	70	4.02	0.99	2	06	18	16	14			0																																	
74	71	2.02	0.99	2	05	13	10	09			0																																	
75	72	1.08	0.99	2	08	13	17	15			3		3	2					4	2					4	3	4	3	4	3	5	3	4	2			4	3			4.33	4.00	4.00	3.50	4.00
76	73	0.90	0.99	8	12	11	13	17			0																																	
77	74	1.42	1.00	2	10	14	09	15			3		4	2	5	3	4	2	5	3	5	3	2	1	4	3	5	3	5	3	4	2	4	3	5	3	4	2	3	2	4.60	3.00	4.33	4.50	5.00
78	75	1.48	1.00	2	09	15	11	12			0																																	
79	76	1.87	1.00	2	07	15	11	15			4		4	3	4	3							4	2	4	2	5	3	4	2	4	2	3	1			3	2	3	2	3.67	3.67	3.50	4.50	
80	77	1.86	1.00	2	00	00	00	00			5		3	2	3	2			3	2							3	2	4	3											4.00		3.00	3.00	3.00
81	78	1.09	1.00	5	12	15	12	14			0																																	
82	79	2.52	1.01	2	12	13	15	18			5		5	3	3	2			5	3			3	2	3	2	5	3	5	3											5.00	3.00	3.00	5.00	5.00
83	80	2.41	1.01	2	00	00	00	00			4		3	2	3	2							3	2	3	2	3	2	3	2	3	2	3	2	3	2					3.00	3.00	3.00	3.00	
84	81	1.80	1.01	2	10	09	14	11			4		4	2	3	2	2	1	3	2	4	2	3	2	2	1	4	2	4	2	4	3	4	3	3	2	3	2	3	2	3.80	2.67	2.67	4.00	3.00
85	82	1.93	1.01	2	05	09	14	14			4		4	3	4	2			5	3					5	2	5	3	5	3	4	2									4.50	5.00	4.00	4.50	5.00
86	83	1.26	1.01	5	07	19	13	19			3		4	2	4	2	3	1	3	1	4	2	4	2	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	4.80	4.67	4.00	4.50	3.00
87	84	2.11	1.02	2	06	17	12	16			4		4	2	5	3			5	3			5	3			5	3	5	3	5	3	5	3			5	3	5	3	5.00	5.00	5.00	4.50	5.00
88	85	1.59	1.02	2	06	16	17	19			0																																	
89	86	1.54	1.02	2	00	00	00	00			0																																	
90	87	2.00	1.02	2	05	17	12	11			2		5	3					5	3			4	2	5	3	5	3	5	3	5	3	3	2					5	3	4.33	4.67		5.00	5.00
91	88	1.49	1.02	2	08	10	10	15			4		4	0	4	0	3	0	3	0			3	0	2	0	4	0	4	0	3	0	4	0	4						3.75	2.50	3.50	4.00	3.00
92	89	1.41	1.02	2	06	17	14	13			3		3	2	4	3	4	3	5	3	4	3	2	1	2	1	4	3	5	3	5	0	4	3	4	3	3	2	3	2	4.40	2.33	3.67	3.50	5.00
93	90	0.81	1.02	8	15	06	10	14			4		3	2	4	2	4	2	5	3	3	2	2	1	3	2	4	3	4	3	4	2	4	2	4	2	4	3	3	2	3.80	2.67	4.00	3.50	5.00
94	91	1.46	1.03	2	06	17	13	12			3		3	2	3	2	3	2	5	2	4	2	2	2	2	2	4	2	4	2	3	2	2	2	3	2	2	2	3	2	3.20	2.33	2.67	3.50	5.00
95	92	2.44	1.03	2	05	14	12	14			0																																	
96	93	1.30	1.03	5	00	00	00	00			4		2	1	3	2	3	1	4	2			4	2	4	2	4	2	4	2	4	2	4	2	4	2	3	2	4	2	4.00	4.00	3.00	3.00	4.00
97	94	0.89	1.03	8	11	16	12	09			4		4	3	4	2			5	3	4	2	4	2	4	2	5	3	5	3	4	3	4	3	4	2	4	2	4	2	4.20	4.00	4.00	4.50	5.00
98	95	1.74	1.04	2	03	16	15	15			3		4	2	3	2			4	2							4	2	5	3	4	3									4.50		3.00	4.00	4.00
99	96	1.41	1.04	2	07	11	13	11			2		5	3													5	3	4	3											4.00			5.00	
100	97	1.52	1.04	2	10	12	11	17			4		3	2	3	1			4	3			4	2	5	3	4	2	5	3	5	3	4	3	4	2	3	2	3	2	4.50	4.00	3.00	3.50	4.00
101	98	1.05	1.04	5	00	00	00	00			0																																	
102	99	1.02	1.04	8	13	15	12	12			0																																	
103	100	1.70	1.05	2	16	10	10	13			0																																	
104	101	1.48	1.05	2	04	16	14	16			0																																	
105	102	1.42	1.05	2	05	15	16	11			0																																	
106	103	1.75	1.06	2	10	13	12	12			3		4	3					5	3			3	2	3	2	3	2	4	3	4	3	4	3	3	2	2	1	3	2	3.75	3.00	2.00	3.50	5.00
107	104	2.07	1.06	2	05	17	15	11			5																4	2	2	1	2	1	2	1	4	1	4	2	5	2	2.50	5.00	4.00	4.00	
108	105	1.88	1.06	2	08	16	17	19			0																																	
109	106	1.12	1.06	5	07	14	13	12			3		3	2	4	2	2	1	4	2	4	3	3	2	4	3	4	3	4	2	5	3	5	3	4	3	3	2	3	2	4.40	3.33	3.00	3.50	4.00
110	107	1.28	1.06	5	04	15	10	07			0																																	
111	108	2.01	1.07	2	07	16	09	12			0																																	
112	109	1.83	1.07	2	10	18	13	16			4		4	3	2	1	3	2	3	2	3	2	4	2	4	3	4	3	4	3	4	3	4	2	3	2	2	1	3	2	3.60	3.67	2.33	4.00	3.00
113	110	2.56	1.07	2	00	00	00	00			0																																	
114	111	1.49	1.07	2	08	12	14	17			4		3	2	4	2	4	2	4				2	1	5	3	5	3	5	3	5	3	5	3	5	3	0	2	5	3	5.00	4.00	2.67	4.00	4.00
115	112	1.28	1.07	5	05	16	09	10			2		3	3					3	2							3	3	3	3											3.00			3.00	3.00
116	113	1.35	1.07	5	05	15	19	14			5		5	3	4	2			5	3			4	2	4	2	5	3	5	3	4	2									4.50	4.00	4.00	5.00	5.00
117	114	1.63	1.08	2	12	07	08	17			2		3	1	1	1	3	1	3	1	3	1	1	1	1	1	1	1	4	2	4	2	3	1	4	2	3	2	2	1	3.60	1.33	2.33	2.00	3.00
118	115	1.66	1.08	2	00	00	00	00			0																																	
119	116	2.36	1.08	2	08	17	17	14			2		5	3	5	3	3	2	3	2	5	3	3	2	3	2	5	3	5	3	5	3	5	3	5	3	4	2	3	2	5.00	3.00	4.00	5.00	3.00
120	117	1.35	1.08	5	00	00	00	00			0																																	
121	118	1.22	1.08	5	15	10	13	17			0																																	
122	119	0.50	1.08	8	08	14	12	12			0																																	
123	120	3.24	1.08	2	06	13	11	16																																				
124	121	0.94	1.08	8	12	13	10	13			3		4	2	4	2							3	2	2	1	5	3	5	3	5	3					4	2	4	2	5.00	3.00	4.00	4.50	
125	122	1.87	1.09	3	11	08	10	14			4		3	1	5	3	4	2	4	2	4	2	3	2	2	2	3	2	4	3	4	3	4	3	3	2	4	2	4	2	3.80	3.00	4.33	3.00	4.00
126	123	1.09	1.09	5	09	13	14	15			1		4	3	4	3	3	3	4	3	3	3	3	3	3	3	5	3	5	3	5	3	5	3	3	3	3	2	3	2	4.20	3.00	3.33	4.50	4.00
127	124	0.91	1.09	8	06	14	14	15			5		4	2	4	3			4	2			4	2	4	3	3	2	3	2							4	2			3.00	4.00	4.00	3.50	4.00
128	125	2.04	1.10	3	08	16	12	08			3		4	3	4	2			5	3			4	2			5	3	5	3	4	2			4	3			4	2	4.33	4.00	4.00	4.50	5.00
129	126	1.14	1.1	6	11	12	12	12			5		4	2	4	2			5	3					5	3	4	2	5	3	5	3	5	3							5.00	5.00	4.00	4.00	5.00
130	127	2.56	1.11	3	07	13	8	8			4		1	1	3	2	3	2	3	2	4	3	2	1	4	2	4	2	5	3	5	3	5	3	5	3	4	3	3	2	4.80	3.00	3.33	2.50	3.00
131	128	1.39	1.11	3	01	16	16	13			0																																	
132	129	1.46	1.11	3	06	14	13	08			0																																	
133	130	2.14	1.12	3	09	10	16	16			3		4	2	4	2	3	1	4	2	5	3	3	2	4	2	4	2	5	3	5	3	4	2	5	3	4	2	4	2	4.80	3.67	3.67	4.00	4.00
134	131	1.74	1.12	3	11	12	09	08			4		4	2	4	2	3	2	3	2	3	2	3	2	3	2	4	3	4	2	4	3	4	3	3	2	3	2	3	2	3.60	3.00	3.33	4.00	3.00
135	132	1.08	1.12	6	00	00	00	00			0																																	
136	133	2.83	1.12	3	09	16	16	16			3		4	2	5	3	3	2	4	2	4	2	3	2	3	2	4	2	4	2	3	2	3	2	4	2	3	2	3	2	3.60	3.00	3.67	4.00	4.00

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
137	134	0.76	1.12	9	06	17	14	16			0																																	
138	135	2.81	1.14	3	8	8	10	11			4		3	2	4	3	3	2	4	3	5	2	2	1	3	1	4	3	5	3	5	3	4	2	5	3	4	3	3	2	4.80	2.67	3.67	3.50	4.00
139	136	2.75	1.14	3	13	11	10	11			2		4	2	4	3	1	1	3	2	4	2	2	1	3	2	5	3	4	3	4	2	4	3	3	2	4	3	3	2	3.80	2.67	3.00	4.50	3.00
140	137	1.65	1.14	3	00	00	00	00			2		4	2	4	2	3	2	3	2	0	0	2	1	2	1	4	2			5	3									2.50	2.00	3.50	4.00	3.00
141	138	2.64	1.14	3	08	19	16	15			4		3	2	4	2	3	2	4	2	4	2	2	1	2	1	3	2	3	2	4	2	4	2	4	2	2	1	2	1	3.80	2.00	3.00	3.00	4.00
142	139	2.23	1.14	3	11	18	19	18			2		4	3	4	3	4	3	4	3	4	3	3	2	3	2	4	3	4	3	4	3	4	3	4	3	3	2	4	3	4.00	3.33	3.67	4.00	4.00
143	140	1.16	1.14	6	14	10	05	15			3		4	3	4	2			5	3			4	3	4	0	5	3									4	2	4	2		4.00	4.00	4.50	5.00
144	141	1.09	1.14	6	12	12	17	13			0																																	
145	142	0.84	1.14	9	00	00	00	00			0																																	
146	143	1.43	1.15	3	00	20	18	19			0																																	
147	144	1.63	1.16	3	14	06	09	14			4		5	3	4	2	4	2	4	2	4	2	4	2	4	2	5	3	5	3	5	3	5	3	5	3	4	3	4	3	4.80	4.00	4.00	5.00	4.00
148	145	2.61	1.16	3	02	19	17	17			0																																	
149	146	2.56	1.16	3	03	19	15	09			4		4	3	4	2	2	2	3	2	3	1	2	2	4	2	4	3	4	3	5	3	4	2	3	2	4	2	3	2	3.80	3.00	3.33	4.00	3.00
150	147	1.03	1.16	6	00	00	00	00			0																																	
151	148	2.52	1.17	3	08	15	14	11			0																																	
152	149	1.73	1.17	3	00	00	00	00			3		4	2	3	2			4	3			4	3	5	3			4	3											4.00	4.50	3.00	4.00	4.00
153	150	1.67	1.17	3	08	16	13	17			2		5	3	4	3	0	2	4	3	0	2	0	1	4	1	5	2	3	2	0	2	3	2	0	2	0	2	0	2	1.20	1.33	1.33	5.00	4.00
154	151	2.26	1.17	3	11	17	14	14			4		3	2	4	3	3	2	4	3	4	3	2	1	2	2	4	3	4	3	4	3	4	3			2	3	2	2	4.00	2.00	3.00	3.50	4.00
155	152	1.25	1.18	6	04	15	18	11			0																																	
156	153	1.27	1.18	6	00	00	00	00			0																																	
157	154	1.53	1.19	2	06	16	15	10			2		3	2	4	2	4	3	5	3	3	2	2	2	4	3	3	2	4	3	4	2	5	3	0	1	4	2	3	1	3.20	3.00	4.00	3.00	5.00
158	155	1.62	1.19	3	11	08	10	17			4		2	2	3	2	3	2	3	2	3	2	2	2	3	2	4	3	4	3	4	3	4	3	4	2	2	2	3	2	3.80	2.67	2.67	3.00	3.00
159	156	1.46	1.20	3	06	13	14	12			0																																	
160	157	2.77	1.2	3	06	13	11	15			3		4	3	3	0			4	3			3	2	3	2	4	3	4	3											4.00	3.00	3.00	4.00	4.00
161	158	2.23	1.20	3	07	17	12	14			3		4	2	5	3	3	1	3	2	3	2	4	3	2	1	4	2	5	3	4	2	5	3	2	1	5	3	4	2	3.80	3.33	4.33	4.00	3.00
162	159	1.59	1.21	3	08	17	16	18			2		5	3	3	2	4	2	4	3	4	3	2	2	4	2	4	3	4	3	4	3	4	3	5	3	4	3	4	2	4.20	3.33	3.67	4.50	4.00
163	160	2.76	1.21	3	08	10	13	12			0																																	
164	161	1.41	1.22	2	16	12	13	19			0																																	
165	162	3.4	1.22	3	00	00	00	00			0																																	
166	163	1.75	1.22	3	15	06	09	15			0																																	
167	164	1.82	1.22	3	09	15	11	16			3		4	2					4	3			4	2	3	2	3	2	4	3											4.00	3.50		3.50	4.00
168	165	1.65	1.22	3	02	16	15	15			4		3	2					4	2			3	0					3	0											3.00	3.00		3.00	4.00
169	166	1.51	1.22	3	07	17	15	16			2		2	2	3	2	4	2	4	2	5	3	3	2	5	2	5	3	5	3	5	3	5	3	4	3	3	3	3	3	5.00	3.67	3.67	3.50	4.00
170	167	1.55	1.23	3	09	13	13	08			0																																	
171	168	1.68	1.23	3	06	12	13	10			4		3	2	4	3	2	2	4	2	4	2	4	3	4	3	4	3	4	2	4	2	4	2	5	3	2	2	3	2	4.20	3.67	2.67	3.50	4.00
172	169	3.07	1.24	3	10	17	15	15			3		4	3	4	2	4	2	4	3	4	2	2	2	2	2	4	3	2	1	4	2	3	2	3	2	2	2	3	2	3.20	2.00	3.67	4.00	4.00
173	170	1.13	1.24	6	12	07	03	05			3		3	2	3	2	3	2	2	2	3	2	3	2	3	2	4	3	4	3	3	2	3	2	2	3	2	2	3	2	3.00	3.00	2.67	3.50	2.00
174	171	1.59	1.24	3	08	10	16	15			3		1	2	3	2	3	2	4	2	4	2	2	1	3	2	4	3	4	3	3	2	4	2	4	3	3	2	3	2	3.80	2.67	3.00	2.50	4.00
175	172	1.38	1.25	3	00	00	00	00			5		5	3					5	3							5	3	5	3											5.00			5.00	5.00
176	173	1.62	1.25	3	03	20	17	15			3		4	2	3	1			5	3	2	1	2	1	3	0	5	3	5	3	4	2	4	0	2	1	4	2	4	2	3.40	3.00	3.50	4.50	5.00
177	174	1.12	1.27	6	11	14	11	11																																				
178	175	2.59	1.27	3	10	12	14	14			4		4	2	4	2	5	3	4	2	4	2	4	2	2	1	4	2	5	2	4	2	2	1	4	2	5	3	4	2	3.80	3.33	4.67	4.00	4.00
179	176	1.33	1.28	6	10	16	12	11			0																																	
180	177	1.50	1.30	2	02	15	14	14			0																																	
181	178	1.05	1.31	6	03	15	12	09			3		4	3											3	2			5	3			5	3							5.00	3.00		4.00	
182	179	1.33	1.31	6	00	00	00	00			2		4	3	4	2	3	2	3	3	4	3	3	2	1	1	4	3	4	3	5	3	5	3	5	3	3	2	3	2	4.60	2.33	3.33	4.00	3.00
183	180	0.94	1.34	9	15	07	09	16			0																																	
184	181	1.42	1.39	3	10	11	11	18			0																																	
185	182	1.30	1.41	6	05	18	11	11			4		3	2	4	3	4	2	4	2	4	3	2	2	3	3	3	2	4	3	5	3	5	3	5	3	5	3	4	2	4.60	3.00	4.33	3.00	4.00
186	183	1.18	1.50	6	07	10	12	12			0																																	
187	184	1.63	1.52	3	10	20	17	13			4		4	3	4	2	5	2	5	3	3	3	4	3	5	3	5	3	4	2	5	3	5	3	5	3	3	2	5	3	4.40	4.67	4.00	4.50	5.00
188												Mode	4	2	4	2	3	2	4	3	4	2	2	2	3	2	4	3	4	3	4	3	4	3	4	3	3	2	3	2					
189		A.Mean	1.06									X	3.72	2.40	3.71	2.17	3.10	1.85	3.93	2.47	3.53	2.11	2.86	1.80	3.30	2.01	4.09	2.58	4.21	2.66	4.10	2.46	3.96	2.34	3.84	2.42	3.36	2.19	3.35	1.99	**Correlations (VI)**				
190		S.D.	0.138									S.D	0.9	0.6	0.8	0.7	0.9	0.6	0.8	0.6	0.9	0.7	0.9	0.6	1.0	0.7	0.8	0.6	0.7	0.6	0.8	0.6	0.9	0.8	1.1	0.6	1.0	0.6	0.9	0.5	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
191												N=	108	107	95	94	63	62	100	98	62	61	91	90	92	91	103	102	106	105	92	91	75	74	69	67	73	72	77	76	0.2682	0.1510	0.1298	0.0452	0.1134
192										Ratings		5	20		13		3		24		5		1		10		33		40		30		20		19		8		8						
193												4	47		46		15		47		32		25		29		48		50		45		39		29		26		20						
194												3	34	50	32	29	34	7	27	52	20	16	29	9	34	22	21	62	14	76	15	47	9	36	16	33	27	20	42	9					
195												2	5	51	3	54	8	40	2	41	3	37	33	56	17	51	0	38	2	24	1	41	7	29	3	29	10	46	6	59					
196												1	2	5	1	9	2	14	0	4	0	7	2	23	2	15	1	1	0	3	0	1	0	7	0	5	0	6	0	6					
197																																													
198										Average1	High Verbal		4.00	2.59	3.76	2.05	2.94	1.80	4.05	2.55	3.38	1.87	2.70	1.79	3.20	2.00	4.19	2.60	4.36	2.62	4.10	2.40	3.76	2.19	4.00	2.38	3.32	2.06	3.05	1.72					
199										Average2	Mod Verbal		3.80	2.28	3.82	2.18	3.18	1.64	4.24	2.43	3.80	2.20	3.20	1.70	3.52	2.10	4.36	2.52	4.44	2.64	4.23	2.32	3.78	2.22	4.00	2.46	3.67	2.33	3.69	2.25					
200										Average3	Mod Imager		3.67	2.25	3.86	2.27	3.00	1.88	3.87	2.32	3.67	2.20	2.86	1.77	3.23	1.95	4.00	2.52	4.22	2.65	4.32	2.64	4.11	2.50	3.94	2.44	3.16	2.00	3.43	2.00					
201										Average4	High Imager		3.63	2.42	3.65	2.10	3.29	2.06	3.91	2.52	3.39	2.22	2.77	1.91	3.27	1.95	4.14	2.71	4.13	2.63	4.00	2.50	4.16	2.42	3.47	2.35	3.28	2.39	3.17	2.11					
202										**Preferences**																																				
203										Diff. betw	HV/HI		0.38	0.17	0.11	-0.05	-0.36	-0.26	0.13	0.03	-0.01	-0.36	-0.07	-0.12	-0.07	0.05	0.05	-0.11	0.24	-0.01	0.10	-0.10	-0.39	-0.23	0.53	0.02	0.04	-0.33	-0.11	-0.39					
204										Average		0.04																																	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
205										S.D.		0.24																																	
206																																												
207										Diff. betw	MV/MI		0.13	0.03	-0.05	-0.09	0.18	-0.24	0.37	0.11	0.13	0.00	0.34	-0.07	0.30	0.14	0.36	0.00	0.22	-0.01	-0.09	-0.32	-0.33	-0.28	0.06	0.02	0.51	0.33	0.26	0.25					
208										Average	diff.	0.17																																	
209										S.D.		0.21																																	
210										Helpfulness																																			
211											HV/HI																																	
212										Average	diff.	-0.12																																	
213										S.D.		####																																	
214																																												
215											MV/MI																																	
216										Average	diff.	-0.01																																	
217										S.D.		####																																	
218																																												
219																																												
220																																												
221										**By Factor**																																			
222																																												
223										**Factor 1**																																			
224										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
225											Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
226										H/V	3.92	2.29									3.38	1.87							4.36	2.62	4.10	2.40	3.76	2.19	4.00	2.38									
227										M/V	4.05	2.37									3.80	2.20							4.44	2.64	4.23	2.32	3.78	2.22	4.00	2.46									
228										M/I	4.05	2.49									3.67	2.20							4.22	2.65	4.32	2.64	4.11	2.50	3.94	2.44									
229										H/I	3.83	2.42									3.39	2.22							4.13	2.63	4.00	2.50	4.16	2.42	3.47	2.35									
230																																												
231																																												
232																																												
233										**Factor 2**																																			
234										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
235										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
236										H/W	2.98	1.84											2.70	1.79	3.20	2.00													3.05	1.72					
237										M/W	3.47	2.02											3.20	1.70	3.52	2.10													3.69	2.25					
238										M/A	3.17	1.91											2.86	1.77	3.23	1.95													3.43	2.00					
239										H/A	3.07	1.99											2.77	1.91	3.27	1.95													3.17	2.11					
240																																												
241																																												
242																																												
243										**Factor 3**																																			
244										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
245										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
246										H/W	3.34	1.97			3.76	2.05	2.94	1.80																			3.32	2.06									
247										M/W	3.56	2.05			3.82	2.18	3.18	1.64																			3.67	2.33									
248										M/A	3.34	2.05			3.86	2.27	3.00	1.88																			3.16	2.00									
249										H/A	3.41	2.18			3.65	2.10	3.29	2.06																			3.28	2.39									
250																																												
251																																												
252										**Factor 4**																																			
253										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
254										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
255										H/W	4.10	2.60	4.00	2.59													4.19	2.60																
256										M/W	4.08	2.40	3.80	2.28													4.36	2.52																
257										M/A	3.83	2.39	3.67	2.25													4.00	2.52																
258										H/A	3.88	2.57	3.63	2.42													4.14	2.71																
259																																												
260																																												
261																																												
262										**Factor 5**																																			
263										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
264										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
265										H/W	4.05	2.55							4.05	2.55																	3.32	2.06									
266										M/W	4.24	2.43							4.24	2.43																	3.67	2.33									
267										M/A	3.87	2.32							3.87	2.32																	3.16	2.00									
268										H/A	3.91	2.52							3.91	2.52																	3.28	2.39									

			CSA							PrvKn	Preference																																			
No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist				1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
1	0.00	0.00	0	00	00	00	00			0																																			
2	0.00	0.00	0	09	08	11	09			0																																			
3	0.00	0.00	0	05	15	13	09			2	3	2	3	2	2	1	4	1	3	2	1	1	3	2	4	3	4	3	4	3	4	3	4	3	3	2	3	2	3.80	2.33	2.67	3.50	4.00
4	0.00	0.00	0	00	00	00	00			0																																			
5	0.00	0.00	0	08	10	04	15			3																																			
6	0.00	0.00	0	08	19	14	18			4	3	3	3	3			3	3							3	3	3	3					3	3					3.00		3.00	3.00	3.00
7	0.00	0.00	0	08	14	15	13			4	4	2	4	2	3	1	4	2	4	2	2	1	3	1	5	3	5	3	4	2	4	2	4	2	5	3	4	2	4.20	3.00	4.00	4.50	4.00
8	0.00	0.00	0	11	10	12	13			5	3	3	3	2			3	3			3	3	3	2	3	3	3	3	3	3									3.00	3.00	3.00	3.00	3.00
9	0.00	0.00	0	08	13	09	15			3	3	3	3	2			3	3							3	3	3	3											3.00		3.00	3.00	3.00
10	0.00	0.00	0	05	19	14	15			3	3	3	3	2			3	3									4	3	3	2									3.50		3.00	3.00	3.00
11	0.00	0.00	0	05	16	12	13			2	3	2					3	3					4	3	3	2	3	3											3.00	4.00		3.00	3.00
12	0.00	0.00	0	02	13	14	13			2	3	3	3	3			3	3			3	2	3	2	3	3	3	3	3	3									3.00	3.00	3.00	3.00	3.00
13	0.00	0.00	0	09	16	13	12			1	5	3	4	3	4	3	4	2	4	2	3	2	3	2	3	2	4	2	5	2	4	2							4.25	3.00	4.00	4.00	4.00
14	0.00	0.00	0	13	15	12	16			3	4	2					4	2			3	2			4	2	4	2	3	2									3.50	3.00		4.00	4.00
15	0.00	0.00	0	08	19	14	18			3	3	3	2	2			3	3			3	2	4	3	3	2	4	3	3	2									3.50	3.50	2.00	3.00	3.00
16	0.00	0.00	0	08	16	14	10			2	3	2	3	2			3	3							3	2	3	3	3	3									3.00		3.00	3.00	3.00
17	0.50	1.08	8	08	14	12	12			0																																		
18	0.69	0.88	7	00	00	00	00			3	4	2	4	2			5	3			4	2	4	2					5	3									5.00	4.00	4.00	4.00	5.00
19	0.74	0.95	7	08	16	13	14			0																																		
20	0.76	1.12	9	06	17	14	16			0																																		
21	0.81	1.02	8	15	06	10	14			4	3	2	4	2	4	2	5	3	3	2	2	1	3	2	4	3	4	3	4	2	4	2	4	2	4	3	3	2	3.80	2.67	4.00	3.50	5.00
22	0.84	1.14	9	00	00	00	00			0																																		
23	0.89	1.03	8	11	16	12	09			4	4	3	4	2			5	3	4	2	4	2	4	2	5	3	5	3	4	3	4	3	4	2	4	2	4	2	4.20	4.00	4.00	4.50	5.00
24	0.90	0.99	8	12	11	13	17			0																																		
25	0.91	1.09	8	06	14	14	15			5	4	2	4	3			4	2			4	2	4	3	3	2	3	2									4	2	3.00	4.00	4.00	3.50	4.00
26	0.92	0.95	7	04	17	13	09			2	4	3					4	2			4	2	3	1	4	2	3	1	4	2					4	2	3	1	3.50	3.33	4.00	4.00	4.00
27	0.94	0.97	7	11	17	11	11			3	4	2	5	2	3	2	3	2	4	2	2	1	4	2	4	2	5	3	5	3	4	2	5	3	5	3	4	2	4.60	3.33	4.33	4.00	3.00
28	0.94	1.08	8	12	13	10	13			3	4	2	4	2							3	2	2	1	5	3	5	3	5	3					4	2	4	2	5.00	3.00	4.00	4.50	
29	0.94	1.34	9	15	07	09	16			0																																		
30	1.00	0.97	7	13	17	15	17			0																																		
31	1.02	1.04	8	13	15	12	12			0																																		
32	1.03	0.91	4	13	09	11	18			3	3	2	4	2	3	2	4	2	4	2	2	1	3	2	4	2	4	3	4	2	4	2	3	2	3	2	3	2	3.80	2.67	3.33	3.50	4.00
33	1.03	1.16	6	00	00	00	00			0																																		
34	1.05	0.88	4	00	00	00	00			2	4	3	4	2	4	2	4	3	3	1	3	2	4	2	4	3	5	3	4	2	4	3	4	2	3	2	3	2	4.00	3.33	3.67	4.00	4.00
35	1.05	0.86	4	15	14	11	17			2	5	3	4	2			4	3							4	3	5	3	4	3									4.50		4.00	4.50	4.00
36	1.05	1.04	5	00	00	00	00			0																																		
37	1.05	1.31	6	03	15	12	09			3	4	3											3	2			5	3			5	3							5.00	3.00		4.00	
38	1.08	0.99	2	08	13	17	15			3	3	2					4	2					4	3	4	3	4	3	5	3	4	2			4	3			4.33	4.00	4.00	3.50	4.00
39	1.08	1.12	6	00	00	00	00			0																																		
40	1.09	1.00	5	12	15	12	14			0																																		
41	1.09	1.09	5	09	13	14	15			1	4	3	4	3	3	3	4	3	3	3	3	3	3	3	5	3	5	3	5	3	5	3	3	3	3	2	3	2	4.20	3.00	3.33	4.50	4.00
42	1.09	1.14	6	12	12	17	13			0																																		
43	1.12	1.06	5	07	14	13	12			3	3	2	4	2	2	1	4	2	4	3	3	2	4	3	4	3	4	2	5	3	5	3	4	3	3	2	3	2	4.40	3.33	3.00	3.50	4.00
44	1.13	1.24	6	12	07	03	05			3	3	2	3	2	3	2	2	2	3	2	3	2	3	2	4	3	4	3	3	2	3	2	2	3	2	2	3	2	3.00	3.00	2.67	3.50	2.00
45	1.14	1.1	6	11	12	12	12			5	4	2	4	2			5	3					5	3	4	2	5	3	5	3	5	3							5.00	5.00	4.00	4.00	5.00
46	1.16	1.14	6	14	10	05	15			3	4	3	4	2			5	3			4	3	4	0	5	3							4	2	4	2			4.00	4.00	4.50	5.00
47	1.18	0.9	4	00	00	00	00			0																																		
48	1.18	1.50	6	07	10	12	12			0																																		
49	1.19	0.98	5	04	14	12	12			3	4	3	4	3			4	3			4	2	3	2	4	3	5	3	5	3									5.00	3.50	4.00	4.00	4.00
50	1.20	0.81	4	05	09	10	09			0																																		
51	1.21	0.83	4	12	08	09	12			1	5	3	5	3									4	2			4	2							5	3			4.00	4.00	5.00	5.00	
52	1.22	1.08	5	15	10	13	17			0																																		
53	1.23	0.93	4	00	00	00	00			0																																		
54	1.25	1.18	6	04	15	18	11			0																																		
55	1.26	0.95	4	09	12	13	17			5	3	2	5	3	3	2	4	2	4	3	2	2	2	2	4	3	4	3	4	2	4	3	4	3	2	1	2	2	4.00	2.00	3.33	3.50	4.00
56	1.26	1.01	5	07	19	13	19			3	4	2	4	2	3	1	3	1	4	2	4	2	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	4.80	4.67	4.00	4.50	3.00
57	1.27	1.18	6	00	00	00	00			0																																		
58	1.28	1.06	5	04	15	10	07			0																																		
59	1.28	1.07	5	05	16	09	10			2	3	3					3	2							3	3	3	3											3.00			3.00	3.00
60	1.29	0.95	4	05	19	12	12			4	2	1	5	3	4	2	5	3	4	2	2	1	3	2	4	2	4	2	5	3	5	3	5	3	4	3	4	0	4.60	3.00	4.33	3.00	5.00
61	1.30	1.03	5	00	00	00	00			4	2	1	3	2	3	1	4	2			4	2	4	2	4	2	4	2	4	2	4	2	4	2	3	2	4	2	4.00	4.00	3.00	3.00	4.00
62	1.30	1.41	6	05	18	11	11			4	3	2	4	3	4	2	4	2	4	3	2	2	3	3	3	2	4	3	5	3	5	3	5	3	5	3	4	2	4.60	3.00	4.33	3.00	4.00
63	1.31	0.94	4	04	19	14	12			3	4	3	2	1	2	1	5	3	3	2	4	2	3	2	5	3	4	3	3	2	4	2	4	2	3	2	3	2	3.60	3.33	2.33	4.50	5.00
64	1.32	0.90	1	09	16	18	16			2	3	3					3	3							3	3	3	3											3.00			3.00	3.00
65	1.33	1.31	6	00	00	00	00			2	4	3	4	2	3	2	3	3	4	3	3	2	1	1	4	3	4	3	5	3	5	3	5	3	3	2	3	2	4.60	2.33	3.33	4.00	3.00
66	1.33	1.28	6	10	16	12	11			0																																		

No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
67	1.34	0.97	4	06	20	18	14			0																																	
68	1.34	0.90	4	07	14	18	16			3		5	3	5	3					4	2	4	2			5	3	5	3	4	2	5	3	5	3			4	2	4.60	4.00	5.00	5.00	
69	1.35	0.96	1	10	12	14	16			0																																	
70	1.35	1.08	5	00	00	00	00			0																																	
71	1.35	1.07	5	05	15	19	14			5		5	3	4	2			5	3			4	2	4	2	5	3	5	3	4	2									4.50	4.00	4.00	5.00	5.00
72	1.38	0.84	1	09	14	13	16			5		2	2	3	1	2	1	3	2	4	2	3	2	4	2	5	3	5	3	5	3	4	2	5	3	4	2	4	2	4.60	3.67	3.00	3.50	3.00
73	1.38	1.25	3	00	00	00	00			5		5	3					5	3							5	3	5	3											5.00			5.00	5.00
74	1.39	1.11	3	01	16	16	13			0																																	
75	1.41	1.22	2	16	12	13	19			0																																	
76	1.41	1.04	2	07	11	13	11			2		5	3													5	3	4	3											4.00			5.00	
77	1.41	1.02	2	06	17	14	13			3		3	2	4	3	4	3	5	3	4	3	2	1	2	1	4	3	5	3	5	0	4	3	4	3	3	2	3	2	4.40	2.33	3.67	3.50	5.00
78	1.42	1.00	2	10	14	09	15			3		4	2	5	3	4	2	5	3	5	3	2	1	4	3	5	3	5	3	4	2	4	3	5	3	4	2	3	2	4.60	3.00	4.33	4.50	5.00
79	1.42	1.05	2	05	15	16	11			0																																	
80	1.42	1.39	3	10	11	11	18			0																																	
81	1.43	1.15	3	00	20	18	19			0																																	
82	1.46	0.98	1							0																																	
83	1.46	1.03	2	06	17	13	12			3		3	2	3	2	3	2	5	2	4	2	2	2	2	2	4	2	4	2	3	2	2	2	3	2	2	2	3	2	3.20	2.33	2.67	3.50	5.00
84	1.46	1.20	3	06	13	14	12			0																																	
85	1.46	1.11	3	06	14	13	08			0																																	
86	1.48	1.00	2	09	15	11	12			0																																	
87	1.48	1.05	2	04	16	14	16			0																																	
88	1.49	1.07	2	08	12	14	17			4		3	2	4	2	4	2	4	0			2	1	5	3	5	3	5	3	5	3	5	3	5	3	5	3	0	2	5	3	5.00	4.00	2.67	4.00	4.00
89	1.49	1.02	2	08	10	10	15			4		4	0	4	0	3	0	3	0			3	0	2	0	4	0	4	0	3	0	4	0	4	0					3.75	2.50	3.50	4.00	3.00
90	1.50	1.30	2	02	15	14	14			0																																	
91	1.51	1.22	3	07	17	15	16			2		2	2	3	2	4	2	4	2	5	3	3	2	5	2	5	3	5	3	5	3	5	3	5	3	4	3	3	3	5.00	3.67	3.67	3.50	4.00
92	1.52	0.81	1	09	12	13	14			0																																	
93	1.52	1.04	2	10	12	11	17			4		3	2	3	1			4	3			4	2	5	3	4	2	5	3	5	3	4	3	4	2	3	2	3	2	4.50	4.00	3.00	3.50	4.00
94	1.53	1.19	2	06	16	15	10			2		3	2	4	2	4	3	5	3	3	2	2	2	4	3	3	2	4	3	4	2	5	3	0	1	4	2	3	1	3.20	3.00	4.00	3.00	5.00
95	1.54	1.02	2	00	00	00	00			0																																	
96	1.55	1.23	3	09	13	13	08			0																																	
97	1.56	0.83	1	09	11	07	07			0																																	
98	1.58	0.95	1	00	00	00	00			0																																	
99	1.59	0.93	1	06	17	14	11			4		5	3	3	2	3	2	4	3	4	3	2	1	2	1	5	3	5	3	5	3	4	3	4	3	2	1	2	1	4.40	2.00	2.67	5.00	4.00
100	1.59	1.02	2	06	16	17	19			0																																	
101	1.59	1.21	3	08	17	16	18			2		5	3	3	2	4	2	4	3	4	3	2	2	4	2	4	3	4	3	4	3	4	3	4	3	5	3	4	3	4	2	4.20	3.33	3.67	4.50	4.00
102	1.59	1.24	3	08	10	16	15			3		1	2	3	2	3	2	4	2	4	2	2	1	3	2	4	3	4	3	3	2	4	2	4	3	3	2	3	2	3.80	2.67	3.00	2.50	4.00
103	1.62	1.19	3	11	08	10	17			4		2	2	3	2	3	2	3	2	3	2	2	2	3	2	4	3	4	3	4	3	4	3	4	2	2	2	3	2	3.80	2.67	2.67	3.00	3.00
104	1.62	1.25	3	03	20	17	15			3		4	2	3	1			5	3	2	1	2	1	3	0	5	3	5	3	4	2	4	0	2	1	4	2	4	2	3.40	3.00	3.50	4.50	5.00
105	1.63	1.08	2	12	07	08	17			2		3	1	1	1	3	1	3	1	3	1	1	1	1	1	1	1	4	2	4	2	3	1	4	2	3	2	2	1	3.60	1.33	2.33	2.00	3.00
106	1.63	1.16	3	14	06	09	14			4		5	3	4	2	4	2	4	2	4	2	4	2	4	2	5	3	5	3	5	3	5	3	4	3	4	3	4	3	4.80	4.00	4.00	5.00	4.00
107	1.63	1.52	3	10	20	17	13			4		4	3	4	2	5	2	5	3	3	3	4	3	5	3	5	3	4	2	5	3	5	3	5	3	3	2	5	3	4.40	4.67	4.00	4.50	5.00
108	1.63	0.81	1	03	20	19	18																																				
109	1.64	0.86	1	06	14	17	13			1		3	2	3	2	5	3	4	2	4	2	4	2	5	3	3	2	4	2	3	2	2	1	4	2	4	2	3	2	3.40	4.00	4.00	3.00	4.00
110	1.65	1.14	3	00	00	00	00			2		4	2	4	2	3	2	3	2			2	1	2	1	4	2			5	3									5.00	2.00	3.50	4.00	3.00
111	1.65	1.22	3	02	16	15	15			4		3	2					4	2			3	0					3	0											3.00	3.00		3.00	4.00
112	1.66	1.08	2	00	00	00	00			0																																	
113	1.67	1.17	3	08	16	13	17			2		5	3	4	3	0	2	4	3	0	2	0	1	4	1	5	2	3	2	0	2	3	2	0	2	0	2	0	2	1.20	1.33	1.33	5.00	4.00
114	1.68	1.23	3	06	12	13	10			4		3	2	4	3	2	2	4	2	4	2	4	3	4	3	4	3	4	2	4	2	4	2	5	3	2	2	3	2	4.20	3.67	2.67	3.50	4.00
115	1.69	0.94	1	11	10	10	16			0																																	
116	1.70	1.05	2	16	10	10	13			0																																	
117	1.71	0.82	1	05	12	07	07			4		5	3	4	2	3	2	2	1	3	2	2	2	2	2	5	3	5	3	5	3	5	2	3	2	4	2	3	2	4.20	2.33	3.67	5.00	2.00
118	1.73	0.87	1	04	19	18	16			4		4	3	4	3	3	2	4	3	3	2	2	2	4	3	3	2	5	3	4	2	4	2	4	2	3	2	3	2	4.00	3.00	3.33	3.50	4.00
119	1.73	1.17	3	00	00	00	00			3		4	2	3	2			4	3	0	0	4	3	5	3			4	3											2.00	4.50	3.00	4.00	4.00
120	1.74	0.89	1	06	14	10	15			4		3	0	3	0	3	0	4	0	4	0	2	0	2	0	4	0	4	0	4	0	4	0	5	0	5	0	3	0	3	0	4.40	2.33	3.00	3.50	4.00
121	1.74	1.04	2	03	16	15	15			3		4	2	3	2			4	2							4	2	5	3	4	3									4.50		3.00	4.00	4.00
122	1.74	1.12	3	11	12	09	08			4		4	2	4	2	3	2	3	2	3	2	3	2	4	3	4	2	4	3	4	3	3	2	3	2	3	2	3	2	3.60	3.00	3.33	4.00	3.00
123	1.75	1.06	2	10	13	12	12			3		4	3					5	3			3	2	3	2	3	2	4	3	4	3	4	3	3	2	2	1	3	2	3.75	3.00	2.00	3.50	5.00
124	1.75	1.22	3	15	06	09	15			0																																	
125	1.75	0.88	1	08	08	10	12																																				
126	1.76	0.98	2	08	14	12	16			2		4	3	4	2							4	2	3	2	5	3	4	3	4	2							3	2	4.00	3.33	4.00	4.50	
127	1.80	0.95	1	10	12	08	11			4		5	3	5	3			5	3			2	1	3	2	4	2	4	2	4	2	4	2	2	1	3	2	3	2	3	2	3.25	2.67	4.00	4.50	5.00
128	1.80	0.76	1	00	15	15	13			2		4	2	3	1	3	2	4	3	2	1	2	2	2	2	4	2	4	2	3	2	2	1	4	3	3	3	3	2	3.00	2.33	3.00	4.00	4.00
129	1.80	1.01	2	10	09	14	11			4		4	2	3	2	2	1	3	2	4	2	3	2	2	1	4	2	4	2	4	3	4	3	3	2	3	2	3	2	3.80	2.67	2.67	4.00	3.00
130	1.82	1.22	3	09	15	11	16			3		4	2					4	3			4	2	3	2	3	2	4	3											4.00	3.50		3.50	4.00
131	1.83	1.07	2	10	18	13	16			4		4	3	2	1	3	2	3	2	3	2	4	2	4	3	4	3	4	3	4	3	4	3	4	2	3	2	2	1	3	2	3.60	3.67	2.33	4.00	3.00
132	1.86	1.00	2	00	00	00	00			5		3	2	3	2			3	2							3	2	4	3											4.00		3.00	3.00	3.00
133	1.87	1.00	2	07	15	11	15			4		4	3	4	3							4	2	4	2	5	3	4	2	4	2	3	1			3	2	3	2	3.67	3.67	3.50	4.50	
134	1.87	1.09	3	11	08	10	14			4		3	1	5	3	4	2	4	2	4	2	3	2	2	2	3	2	4	3	4	3	4	3	3	2	4	2	4	2	3.80	3.00	4.33	3.00	4.00

No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
135	1.88	1.06	2	08	16	17	19			0																																
136	1.89	0.97	1	09	13	12	11			2		4	3	4	3	3	2	4	3	3	2	2	1	3	2	4	2	4	2	4	3	4	2	4	3	3	2	3	2	3.80	2.67	3.33	4.00	4.00
137	1.93	0.83	1	12	14	10	15			0																																
138	1.93	1.01	2	05	09	14	14			4		4	3	4	2			5	3					5	2	5	3	5	3	4	2									4.50	5.00	4.00	4.50	5.00
139	1.95	0.98	1	11	14	09	13			4		5	3	5	3	3	2	5	3	3	2	3	2	4	3	5	3	4	3	4	2	3	2	4	3	4	2	5	3	3.60	4.00	4.00	5.00	5.00
140	1.98	0.95	1	09	09	13	18			4		5	3	3	1	3	1	4	2	2	1	3	2	4	2	5	3	5	3	4	2	4	2	4	2	3	1	3	1	3.80	3.33	3.00	5.00	4.00
141	2.00	1.02	2	05	17	12	11			2		5	3					5	3			4	2	5	3	5	3	5	3	5	3	3	2					5	3	4.33	4.67		5.00	5.00
142	2.01	1.07	2	07	16	09	12			0																																
143	2.02	0.99	2	05	13	10	09			0																																
144	2.02	0.98	2	11	13	07	12			0																																
145	2.04	1.10	3	08	16	12	08			3		4	3	4	2			5	3			4	2			5	3	5	3	4	2			4	3			4	2	4.33	4.00	4.00	4.50	5.00
146	2.05	0.84	1	08	17	11	12			0																																
147	2.07	0.85	1	07	16	12	10			0																																
148	2.07	1.06	2	05	17	15	11			5																4	2	2	1	2	1	2	1	4	1	4	2	5	2	2.50	5.00	4.00	4.00	
149	2.09	0.98	1	13	05	08	15			0																																
150	2.11	1.02	2	06	17	12	16			4		4	2	5	3			5	3			5	3			5	3	5	3	5	3	5	3			5	3	5	3	5.00	5.00	5.00	4.50	5.00
151	2.13	0.87	1	06	14	15	10			0																																
152	2.14	1.12	3	09	10	16	16			3		4	2	4	2	3	1	4	2	5	3	3	2	4	2	4	2	5	3	5	3	4	2	5	3	4	2	4	2	4.80	3.67	3.67	4.00	4.00
153	2.23	1.14	3	11	18	19	18			2		4	3	4	3	4	3	4	3	4	3	3	2	3	2	4	3	4	3	4	3	4	3	4	3	3	2	4	3	4.00	3.33	3.67	4.00	4.00
154	2.23	1.20	3	07	17	12	14			3		4	2	5	3	3	1	3	2	3	2	4	3	2	1	4	2	5	3	4	2	5	3	2	1	5	3	4	2	3.80	3.33	4.33	4.00	3.00
155	2.26	0.95	1	05	14	09	08			3		5	3	4	2	3	2	5	3	3	1	2	1	3	1	5	3	5	3	4	3	4	3	3	1	3	2	3	2	3.80	2.67	3.33	5.00	5.00
156	2.26	1.17	3	11	17	14	14			4		3	2	4	3	3	2	4	3	4	3	2	1	2	2	4	3	4	3	4	3	4	3			2	3	2	2	4.00	2.00	3.00	3.50	4.00
157	2.30	0.98	2	08	17	13	18			0																																
158	2.33	0.97	1	05	04	09	15			0																																
159	2.36	1.08	2	08	17	17	14			2		5	3	5	3	3	2	3	2	5	3	3	2	3	2	5	3	5	3	5	3	5	3	5	3	4	2	3	2	5.00	3.00	4.00	5.00	3.00
160	2.38	0.9	1	08	13	11	15																																			
161	2.40	0.90	1	05	19	15	14			0																																
162	2.41	1.01	2	00	00	00	00			4		3	2	3	2							3	2	3	2	3	2	3	2	3	2	3	2	3	2					3.00	3.00	3.00	3.00	
163	2.44	1.03	2	05	14	12	14			0																																
164	2.52	1.01	2	12	13	15	18			5		5	3	3	2			5	3			3	2	3	2	5	3	5	3											5.00	3.00	3.00	5.00	5.00
165	2.52	1.17	3	08	15	14	11			0																																
166	2.56	1.11	3	07	13	8	8			4		1	1	3	2	3	2	3	2	4	3	2	1	4	2	4	2	5	3	5	3	5	3	5	3	4	3	3	2	4.80	3.00	3.33	2.50	3.00
167	2.56	1.07	2	00	00	00	00			0																																
168	2.56	1.16	3	03	19	15	09			4		4	3	4	2	2	2	3	2	3	1	2	2	4	2	4	3	4	3	5	3	4	2	3	2	4	2	3	2	3.80	3.00	3.33	4.00	3.00
169	2.59	1.27	3	10	12	14	14			4		4	2	4	2	5	3	4	2	4	2	4	2	2	1	4	2	5	2	4	2	2	1	4	2	5	3	4	2	3.80	3.33	4.67	4.00	4.00
170	2.61	1.16	3	02	19	17	17			0																																
171	2.64	1.14	3	08	19	16	15			4		3	2	4	2	3	2	4	2	4	2	2	1	2	1	3	2	3	2	4	2	4	2	4	2	2	1	2	1	3.80	2.00	3.00	3.00	4.00
172	2.69	0.95	1	05	16	10	14			3		5	3	3	1	2	1	4	2			3	2	3	2	4	2	5	3	4	2					3	2	3	2	4.50	3.00	2.67	4.50	4.00
173	2.75	1.14	3	13	11	10	11			2		4	2	4	3	1	1	3	2	4	2	2	1	3	2	5	3	4	3	4	2	4	3	3	2	4	3	3	2	3.80	2.67	3.00	4.50	3.00
174	2.76	1.21	3	08	10	13	12			0																																
175	2.77	1.2	3	06	13	11	15			3		4	3	3	0			4	3			3	2	3	2	4	3	4	3											4.00	3.00	3.00	4.00	4.00
176	2.81	1.14	3	8	8	10	11			4		3	2	4	3	3	2	4	3	5	2	2	1	3	1	4	3	5	3	5	3	4	2	5	3	4	3	3	2	4.80	2.67	3.67	3.50	4.00
177	2.83	1.12	3	09	16	16	16			3		4	2	5	3	3	2	4	2	4	2	3	2	3	2	4	2	4	2	3	2	3	2	4	2	3	2	3	2	3.60	3.00	3.67	4.00	4.00
178	3.07	1.24	3	10	17	15	15			3		4	3	4	2	4	2	4	3	4	2	2	2	2	2	4	3	2	1	4	2	3	2	3	2	3	2	2	2	3.20	2.00	3.67	4.00	4.00
179	3.24	1.08	2	06	13	11	16																																			
180	3.4	1.22	3	00	00	00	00			0																																
181	4.02	0.99	2	06	18	16	14			0																																
182	4.74	0.94	1	00	00	00	00			0																																
											Mode	4	2	4	2	3	2	4	3	4	2	2	2	3	2	4	3	4	3	4	3	4	3	4	3	4	3	3	2	3	2					
											X	3.72	2.38	3.71	2.15	3.13	1.82	3.93	2.41	3.54	2.08	2.87	1.77	3.30	1.98	4.09	2.55	4.21	2.64	4.10	2.43	3.99	2.31	3.84	2.34	3.35	2.15	3.33	1.99					
											S.D	0.9	0.7	0.8	0.7	0.9	0.7	0.8	0.7	1.0	0.7	0.9	0.7	1.0	0.8	0.8	0.6	0.7	0.7	0.8	0.7	0.8	0.8	1.1	0.7	1.0	0.6	0.9	0.6					
											N=	107	107	94	94	62	62	99	99	61	61	90	90	91	91	102	102	105	105	91	91	74	74	68	68	72	72	75	75	**Correlations (WA)**				
										Ratings	5	20		13		3		24		5		1		10		33		40		30		20		19		8		7		**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
											4	46		46		15		46		32		25		28		47		49		44		39		28		25		20		0.1365	-0.1027	0.0297	0.2340	0.1523
											3	34	50	31	29	34	7	27	51	19	16	29	8	34	21	21	61	14	76	15	46	9	36	16	32	27	19	41	9					
											2	5	50	3	53	8	39	2	41	3	36	32	56	17	51	0	38	2	23	1	41	6	28	3	29	10	46	6	58					
											1	2	5	1	9	1	14	0	4	0	7	2	23	2	15	1	1	0	3	0	1	0	7	0	5	0	6	0	6					
	1.68																																												
	0.621									Avg1	H Whol	3.81	2.43	4.11	2.28	3.11	1.89	4.06	2.44	3.60	2.20	3.19	1.94	3.55	2.10	4.22	2.72	4.42	2.74	4.47	2.65	4.31	2.62	3.80	2.60	3.67	2.27	3.43	2.00					
										Avg2	Mod Whol	3.40	2.20	3.75	2.00	3.38	1.77	4.17	2.33	4.00	2.45	2.88	1.63	3.40	2.07	4.25	2.55	4.35	2.70	4.31	2.19	4.33	2.53	4.20	2.40	3.23	2.23	3.50	1.93					
										Avg3	Mod Anal	3.88	2.36	3.50	2.03	3.09	1.82	3.90	2.32	3.00	1.78	2.73	1.70	3.27	1.93	4.06	2.42	4.19	2.47	3.93	2.41	3.76	2.00	3.67	2.25	2.96	1.88	3.12	1.92					
										Avg4	High Anal	3.90	2.43	3.95	2.25	3.00	1.87	4.00	2.50	4.00	2.21	2.90	1.81	3.00	1.79	4.23	2.59	4.27	2.64	4.15	2.45	3.78	2.33	3.81	2.19	3.65	2.35	3.42	2.11					
										Diff. betw	HW/HA	-0.10	0.00	0.16	0.03	0.11	0.02	0.06	-0.06	-0.40	-0.01	0.28	0.13	0.55	0.31	-0.01	0.13	0.15	0.10	0.32	0.20	0.53	0.28	-0.01	0.41	0.02	-0.09	0.01	-0.11					
										Avge	0.12																																		
										S.D.	0.24																																		

No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
									Diff. betw	MV/MI		-0.48	-0.16	0.25	-0.03	0.29	-0.05	0.26	0.01	1.00	0.67	0.14	-0.08	0.13	0.13	0.19	0.13	0.16	0.23	0.38	-0.23	0.57	0.53	0.53	0.15	0.27	0.35	0.38	0.01					
									Avge	diff.	0.29																																		
									S.D.		0.31																																		
									Helpfulness																																				
										HV/HI																																		
									Avge	diff.	0.10																																		
									S.D.		####																																		
										MV/MI																																		
									Avge	diff.	0.12																																		
									S.D.		####																																		
									By Factor																																			
									Factor 1																																			
									CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
										Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
									H/W	4.12	2.56	3.81	2.43							3.60	2.20							4.42	2.74	4.47	2.65	4.31	2.62	3.80	2.60											
									M/W	4.24	2.46	3.40	2.20							4.00	2.45							4.35	2.70	4.31	2.19	4.33	2.53	4.20	2.40											
									M/A	3.71	2.18	3.88	2.36							3.00	1.78							4.19	2.47	3.93	2.41	3.76	2.00	3.67	2.25											
									H/A	4.00	2.36	3.90	2.43							4.00	2.21							4.27	2.64	4.15	2.45	3.78	2.33	3.81	2.19											
									Factor 2																																			
									CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
									type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
									H/W	3.39	2.01											3.19	1.94	3.55	2.10													3.43	2.00					
									M/W	3.26	1.87											2.88	1.63	3.40	2.07													3.50	1.93					
									M/A	3.04	1.85											2.73	1.70	3.27	1.93													3.12	1.92					
									H/A	3.11	1.90											2.90	1.81	3.00	1.79													3.42	2.11					
									Factor 3																																			
									CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
									type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
									H/W	3.63	2.14			4.11	2.28	3.11	1.89																			3.67	2.27									
									M/W	3.46	2.00			3.75	2.00	3.38	1.77																			3.23	2.23									
									M/A	3.18	1.91			3.50	2.03	3.09	1.82																			2.96	1.88									
									H/A	3.53	2.16			3.95	2.25	3.00	1.87																			3.65	2.35									
									Factor 4																																			
									CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
									type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
									H/W	4.02	2.58	3.81	2.43													4.22	2.72																	
									M/W	3.83	2.38	3.40	2.20													4.25	2.55																	
									M/A	3.97	2.39	3.88	2.36													4.06	2.42																	
									H/A	4.07	2.51	3.90	2.43													4.23	2.59																	
									Factor 5																																			
									CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H					
									type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28					
									H/W	4.06	2.44							4.06	2.44																	3.67	2.27									
									M/W	4.17	2.33							4.17	2.33																	3.23	2.23									
									M/A	3.90	2.32							3.90	2.32																	2.96	1.88									
									H/A	4.00	2.50							4.00	2.50																	3.65	2.35									

No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5

No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
									3	3.97	2.39	3.88	2.36													4.06	2.42																
									4	4.07	2.51	3.90	2.43													4.23	2.59																
									5	0.00	0.00	0.00	0.00													0.00	0.00																
									6	-0.05	0.07	###	0.00													###	0.13																
									7	0.00	0.00	0.00	0.00													0.00	0.00																
									8	0.00	0.00	0.00	0.00													0.00	0.00																
									9	0.00	0.00	0.00	0.00													0.00	0.00																
									Factor 5																																					
									CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14						
									type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27						
									1	4.06	2.44							4.06	2.44																	4.00	2.00							
									2	4.17	2.33							4.17	2.33																	5.00	3.00							
									3	3.90	2.32							3.90	2.32																	0.00	0.00							
									4	4.00	2.50							4.00	2.50																	2.00	1.00							
									5	0.00	0.00							0.00	0.00																	3.00	2.00							
									6	0.06	-0.06							0.06	###																	4.00	3.00							
									7	0.00	0.00							0.00	0.00																	0.00	0.00							
									8	0.00	0.00							0.00	0.00																	0.00	0.00							
									9	0.00	0.00							0.00	0.00																	4.00	3.00							
									Analysis of Previous Knowledge																																						
									CSA		Raw numbers						N=	101																											
									Rating		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**T**	**T%**																							
									1		1	1	0	0	1	1	0	0	0	-	4	###																							
									2		4	3	6	4	2	1	1	1	0	-	22	###																							
									3		5	2	6	8	3	3	3	2	1	-	33	###																							
									4		2	7	9	10	1	1	0	0	2	-	32	###																							
									5		1	1	3	1	1	1	1	0	1	-	10	###																							
											Percentages/Group										N=																							
									CSA	N=	13	14	24	23	8	7	5	3	4	0	101																							
									Rating		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**																							
									1		####	###	###	###	###	###	###	###	###	-																							
									2		####	###	###	###	###	###	###	###	###	-																							
									3		####	###	###	###	###	###	###	###	###	-																							
									4		####	###	###	###	###	###	###	###	###	-																							
									5		####	###	###	###	###	###	###	###	###	-																							

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																								
2				CSA							PrvKn		Preference																												
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
4	1	1.73	0.87	1	04	19	18	16			4		4	3	4	3	3	2	4	3	3	2	2	2	4	3	3	2	5	3	4	2	4	2	4	2	3	2	3	2	
5	2	2.38	0.9	1	08	13	11	15																																	
6	3	1.63	0.81	1	03	20	19	18																																	
7	4	1.75	0.88	1	08	08	10	12																																	
8	5	2.40	0.90	1	05	19	15	14			0																														
9	6	1.35	0.96	1	10	12	14	16			0																														
10	7	2.07	0.85	1	07	16	12	10			0																														
11	8	1.80	0.95	1	10	12	08	11			4		5	3	5	3			5	3			2	1	3	2	4	2	4	2	4	2	2	1	3	2	3	2	3	2	
12	9	1.64	0.86	1	06	14	17	13			1		3	2	3	2	5	3	4	2	4	2	4	2	5	3	3	2	4	2	3	2	2	1	4	2	4	2	3	2	
13	10	1.74	0.89	1	06	14	10	15			4		3		3		3		4		4		2		2		4		4		4		5		5		3		3		
14	11	1.95	0.98	1	11	14	09	13			4		5	3	5	3	3	2	5	3	3	2	3	2	4	3	5	3	4	3	4	2	3	2	4	3	4	2	5	3	
15	12	1.56	0.83	1	09	11	07	07			0																														
16	13	1.46	0.98	1							0																														
17	14	2.33	0.97	1	05	04	09	15			0																														
18	15	1.71	0.82	1	05	12	07	07			4		5	3	4	2	3	2	2	1	3	2	2	2	2	2	5	3	5	3	5	3	5	2	3	2	4	2	3	2	
19	16	1.32	0.90	1	09	16	18	16			2		3	3					3	3							3	3	3	3										
20	17	1.98	0.95	1	09	09	13	18			4		5	3	3	1	3	1	4	2	2	1	3	2	4	2	5	3	5	3	4	2	4	2	4	2	3	1	3	1	
21	18	1.52	0.81	1	09	12	13	14			0																														
22	19	1.84	0.89	1	00	00	00	00			4		4	2	3	2	1	2	4	3	3	2	2	3	4	3	4	3	4	2	4	3	2	2	4	3	4	3	3	2	
23	20	2.26	0.95	1	05	14	09	08			3		5	3	4	2	3	2	5	3	3	1	2	1	3	1	5	3	5	3	4	3	4	3	3	1	3	2	3	2	
24	21	1.89	0.97	1	09	13	12	11			2		4	3	4	3	3	2	4	3	3	2	2	1	3	2	4	2	4	2	4	3	4	2	4	3	3	2	3	2	
25	22	1.80	0.76	1	00	15	15	13			2		4	2	3	1	3	2	4	3	2	1	2	2	2	2	4	2	4	2	3	2	2	1	4	3	3	3	3	2	
26	23	1.59	0.93	1	06	17	14	11			4		5	3	3	2	3	2	4	3	4	3	2	1	2	1	5	3	5	3	5	3	4	3	4	3	2	1	2	1	
27	24	1.69	0.94	1	11	10	10	16			0																														
28	25	1.93	0.83	1	12	14	10	15			0																														
29	26	2.09	0.98	1	13	05	08	15			0																														
30	27	2.05	0.84	1	08	17	11	12			0																														
31	28	1.38	0.84	1	09	14	13	16			5		2	2	3	1	2	1	3	2	4	2	3	2	4	2	5	3	5	3	5	3	4	2	5	3	4	2	4	2	
32	29	4.74	0.94	1	00	00	00	00			0																														
33	30	1.84	1.07	2																																					
34	31	3.24	1.08	2	06	13	11	16																																	
35	32	1.75	1.06	2	10	13	12	12			3		4	3					5	3			3	2	3	2	3	2	4	3	4	3	4	3	3	2	2	1	3	2	
36	33	2.52	1.01	2	12	13	15	18			5		5	3	3	2			5	3			3	2	3	2	5	3	5	3											
37	34	2.01	1.07	2	07	16	09	12			0																														
38	35	2.41	1.01	2	00	00	00	00			4		3	2	3	2							3	2	3	2	3	2	3	2	3	2	3	2	3	2					
39	36	1.83	1.07	2	10	18	13	16			4		4	3	2	1	3	2	3	2	3	2	4	2	4	3	4	3	4	3	4	3	4	2	3	2	2	1	3	2	
40	37	4.02	0.99	2	06	18	16	14			0																														
41	38	1.50	1.30	2	02	15	14	14			0																														
42	39	1.76	0.98	2	08	14	12	16			2		4	3	4	2							4	2	3	2	5	3	4	3	4	2							3	2	
43	40	1.42	1.00	2	10	14	09	15			3		4	2	5	3	4	2	5	3	5	3	2	1	4	3	5	3	5	3	4	2	4	3	5	3	4	2	3	2	
44	41	1.48	1.00	2	09	15	11	12			0																														
45	42	2.11	1.02	2	06	17	12	16			4		4	2	5	3			5	3			5	3			5	3	5	3	5	3	5	3			5	3	5	3	
46	43	2.30	0.98	2	08	17	13	18			0																														
47	44	2.07	1.06	2	05	17	15	11			5																4	2	2	1	2	1	2	1	4	1	4	2	5	2	
48	45	2.56	1.07	2	00	00	00	00			0																														
49	46	1.63	1.08	2	12	07	08	17			2		3	1	1	1	3	1	3	1	3	1	1	1	1	1	1	1	4	2	4	2	3	1	4	2	3	2	2	1	
50	47	1.59	1.02	2	06	16	17	19			0																														
51	48	1.46	1.03	2	06	17	13	12			3		3	2	3	2	3	2	5	2	4	2	2	2	2	2	4	2	4	2	3	2	2	2	3	2	2	2	3	2	
52	49	1.49	1.07	2	08	12	14	17			4		3	2	4	2	4	2	4				2	1	5	3	5	3	5	3	5	3	5	3	5	3	5	3		2	5	3	
53	50	1.41	1.22	2	16	12	13	19			0																														
54	51	1.66	1.08	2	00	00	00	00			0																														
55	52	1.54	1.02	2	00	00	00	00			0																														
56	53	1.74	1.04	2	03	16	15	15			3		4	2	3	2			4	2							4	2	5	3	4	3									
57	54	3.24	1.08	2	06	13	11	16																																	
58	55	1.53	1.19	2	06	16	15	10			2		3	2	4	2	4	3	5	3	3	2	2	2	4	3	3	2	4	3	4	2	5	3		1	4	2	3	1	
59	56	2.02	0.99	2	05	13	10	09			0																														

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																													
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
60	57	1.80	1.01	2	10	09	14	11			4		4	2	3	2	2	1	3	2	4	2	3	2	2	1	4	2	4	2	4	3	4	3	3	2	3	2	3	2	
61	58	2.02	0.98	2	11	13	07	12			0																													
62	59	2.36	1.08	2	08	17	17	14			2		5	3	5	3	3	2	3	2	5	3	3	2	3	2	5	3	5	3	5	3	5	3	5	3	4	2	3	2	
63	60	1.08	0.99	2	08	13	17	15			3		3	2					4	2					4	3	4	3	4	3	5	3	4	2			4	3			
64	61	2.00	1.02	2	05	17	12	11			2		5	3					5	3			4	2	5	3	5	3	5	3	5	3	3	2				5	3	
65	62	1.87	1.00	2	07	15	11	15			4		4	3	4	3							4	2	4	2	5	3	4	2	4	2	3	1			3	2	3	2	
66	63	1.70	1.05	2	16	10	10	13			0																													
67	64	1.48	1.05	2	04	16	14	16			0																													
68	65	1.42	1.05	2	05	15	16	11			0																													
69	66	1.49	1.02	2	08	10	10	15			4		4		4		3		3				3		2		4		4		3		4		4						
70	67	1.88	1.06	2	08	16	17	19			0																													
71	68	1.41	1.04	2	07	11	13	11			2		5	3													5	3	4	3										
72	69	1.41	1.02	2	06	17	14	13			3		3	2	4	3	4	3	5	3	4	3	2	1	2	1	4	3	5	3	5		4	3	4	3	3	2	3	2	
73	70	1.93	1.01	2	05	09	14	14			4		4	3	4	2			5	3					5	2	5	3	5	3	4	2									
74	71	2.44	1.03	2	05	14	12	14			0																													
75	72	1.52	1.04	2	10	12	11	17			4		3	2	3	1			4	3			4	2	5	3	4	2	5	3	5	3	4	3	4	2	3	2	3	2	
76	73	1.86	1.00	2	00	00	00	00			5		3	2	3	2			3	2							3	2	4	3											
77	74	2.81	1.14	3	8	8	10	11			4		3	2	4	3	3	2	4	3	5	2	2	1	3	1	4	3	5	3	5	3	4	2	5	3	4	3	3	2	
78	75	1.85	1.35	3																																				
79	76	2.56	1.11	3	07	13	8	8			4		1	1	3	2	3	2	3	2	4	3	2	1	4	2	4	2	5	3	5	3	5	3	5	3	4	3	3	2	
80	77	2.75	1.14	3	13	11	10	11			2		4	2	4	3	1	1	3	2	4	2	2	1	3	2	5	3	4	3	4	2	4	3	3	2	4	3	3	2	
81	78	2.64	1.14	3	08	19	16	15			4		3	2	4	2	3	2	4	2	4	2	2	1	2	1	3	2	3	2	4	2	4	2	4	2	2	1	2	1	
82	79	2.83	1.12	3	09	16	16	16			3		4	2	5	3	3	2	4	2	4	2	3	2	3	2	4	2	4	2	3	2	3	2	4	2	3	2	3	2	
83	80	1.51	1.22	3	07	17	15	16			2		2	2	3	2	4	2	4	2	5	3	3	2	5	2	5	3	5	3	5	3	5	3	5	3	4	3	3	3	
84	81	1.59	1.24	3	08	10	16	15			3		1	2	3	2	3	2	4	2	4	2	2	1	3	2	4	3	4	3	3	2	4	2	4	3	3	2	3	2	
85	82	3.4	1.22	3	00	00	00	00			0																													
86	83	1.55	1.23	3	09	13	13	08			0																													
87	84	2.14	1.12	3	09	10	16	16			3		4	2	4	2	3	1	4	2	5	3	3	2	4	2	4	2	5	3	5	3	4	2	5	3	4	2	4	2	
88	85	1.75	1.22	3	15	06	09	15			0																													
89	86	1.65	1.14	3	00	00	00	00			2		4	2	4	2	3	2	3	2			2	1	2	1	4	2			5	3									
90	87	2.04	1.10	3	08	16	12	08			3		4	3	4	2			5	3			4	2			5	3	5	3	4	2			4	3			4	2	
91	88	2.52	1.17	3	08	15	14	11			0																													
92	89	1.74	1.12	3	11	12	09	08			4		4	2	4	2	3	2	3	2	3	2	3	2	3	2	4	3	4	2	4	3	4	3	3	2	3	2	3	2	
93	90	2.23	1.14	3	11	18	19	18			2		4	3	4	3	4	3	4	3	4	3	3	2	3	2	4	3	4	3	4	3	4	3	4	3	3	2	4	3	
94	91	1.42	1.39	3	10	11	11	18			0																													
95	92	1.59	1.21	3	08	17	16	18			2		5	3	3	2	4	2	4	3	4	3	2	2	4	2	4	3	4	3	4	3	4	3	5	3	4	3	4	2	
96	93	1.73	1.17	3	00	00	00	00			3		4	2	3	2			4	3			4	3	5	3			4	3											
97	94	1.82	1.22	3	09	15	11	16			3		4	2					4	3			4	2	3	2	3	2	4	3											
98	95	1.67	1.17	3	08	16	13	17			2		5	3	4	3		2	4	3		2		1	4	1	5	2	3	2		2	3	2		2		2		2	
99	96	1.63	1.16	3	14	06	09	14			4		5	3	4	2	4	2	4	2	4	2	4	2	4	2	5	3	5	3	5	3	5	3	5	3	4	3	4	3	
100	97	1.62	1.19	3	11	08	10	17			4		2	2	3	2	3	2	3	2	3	2	2	2	3	2	4	3	4	3	4	3	4	3	4	2	2	2	3	2	
101	98	1.46	1.20	3	06	13	14	12			0																													
102	99	1.39	1.11	3	01	16	16	13			0																													
103	100	1.43	1.15	3	00	20	18	19			0																													
104	101	2.77	1.2	3	06	13	11	15			3		4	3	3				4	3			3	2	3	2	4	3	4	3											
105	102	2.61	1.16	3	02	19	17	17			0																													
106	103	1.68	1.23	3	06	12	13	10			4		3	2	4	3	2	2	4	2	4	2	4	3	4	3	4	3	4	2	4	2	4	2	5	3	2	2	3	2	
107	104	1.65	1.22	3	02	16	15	15			4		3	2					4	2									3											
108	105	1.46	1.11	3	06	14	13	08			0																													
109	106	2.26	1.17	3	11	17	14	14			4		3	2	4	3	3	2	4	3	4	3	2	1	2	2	4	3	4	3	4	3	4	3			2	3	2	2	
110	107	2.56	1.16	3	03	19	15	09			4		4	3	4	2	2	2	3	2	3	1	2	2	4	2	4	3	4	3	5	3	4	2	3	2	4	2	3	2	
111	108	1.63	1.52	3	10	20	17	13			4		4	3	4	2	5	2	5	3	3	3	4	3	5	3	5	3	4	2	5	3	5	3	5	3	3	2	5	3	
112	109	2.23	1.20	3	07	17	12	14			3		4	2	5	3	3	1	3	2	3	2	4	3	2	1	4	2	5	3	4	2	5	3	2	1	5	3	4	2	
113	110	1.38	1.25	3	00	00	00	00			5		5	3					5	3							5	3	5	3											
114	111	1.62	1.25	3	03	20	17	15			3		4	2	3	1			5	3	2	1	2	1	3		5	3	5	3	4	2	4		2	1	4	2	4	2	
115	112	1.87	1.09	3	11	08	10	14			4		3	1	5	3	4	2	4	2	4	2	3	2	2	2	3	2	4	3	4	3	4	3	3	2	4	2	4	2	
116	113	2.76	1.21	3	08	10	13	12			0																													

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																													
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
117	114	3.07	1.24	3	10	17	15	15			3		4	3	4	2	4	2	4	3	4	2	2	2	2	2	4	3	2	1	4	2	3	2	3	2	3	2	2	2	
118	115	2.59	1.27	3	10	12	14	14			4		4	2	4	2	5	3	4	2	4	2	4	2	2	1	4	2	5	2	4	2	2	1	4	2	5	3	4	2	
119	116	1.29	0.95	4	05	19	12	12			4		2	1	5	3	4	2	5	3	4	2	2	1	3	2	4	2	4	2	5	3	5	3	5	3	4	3	4		
120	117	1.34	0.97	4	06	20	18	14			0																														
121	118	1.20	0.81	4	05	09	10	09			0																														
122	119	1.03	0.91	4	13	09	11	18			3		3	2	4	2	3	2	4	2	4	2	2	1	3	2	4	2	4	3	4	2	4	2	3	2	3	2	3	2	
123	120	1.21	0.83	4	12	08	09	12			1		5	3	5	3									4	2	0	0	4	2							5	3			
124	121	1.31	0.94	4	04	19	14	12			3		4	3	2	1	2	1	5	3	3	2	4	2	3	2	5	3	4	3	3	2	4	2	4	2	3	2	3	2	
125	122	1.18	0.9	4	00	00	00	00			0																														
126	123	1.23	0.93	4	00	00	00	00			0																														
127	124	1.05	0.88	4	00	00	00	00			2		4	3	4	2	4	2	4	3	3	1	3	2	4	2	4	3	5	3	4	2	4	3	4	2	3	2	3	2	
128	125	1.05	0.86	4	15	14	11	17			2		5	3	4	2			4	3							4	3	5	3	4	3									
129	126	1.34	0.90	4	07	14	18	16			3		5	3	5	3					4	2	4	2			5	3	5	3	4	2	5	3	5	3			4	2	
130	127	1.26	0.95	4	09	12	13	17			5		3	2	5	3	3	2	4	2	4	3	2	2	2	2	4	3	4	3	4	2	4	3	4	3	2	1	2	2	
131	128	1.35	1.08	5	00	00	00	00			0																														
132	129	1.19	0.98	5	04	14	12	12			3		4	3	4	3			4	3			4	2	3	2	4	3	5	3	5	3									
133	130	1.12	1.06	5	07	14	13	12			3		3	2	4	2	2	1	4	2	4	3	3	2	4	3	4	3	4	2	5	3	5	3	4	3	3	2	3	2	
134	131	1.28	1.06	5	04	15	10	07			0																														
135	132	1.09	1.00	5	12	15	12	14			0																														
136	133	1.30	1.03	5	00	00	00	00			4		2	1	3	2	3	1	4	2			4	2	4	2	4	2	4	2	4	2	4	2	4	2	3	2	4	2	
137	134	1.22	1.08	5	15	10	13	17			0																														
138	135	1.05	1.04	5	00	00	00	00			0																														
139	136	1.28	1.07	5	05	16	09	10			2		3	3					3	2	0	0					3	3	3	3											
140	137	1.09	1.09	5	09	13	14	15			1		4	3	4	3	3	3	4	3	3	3	3	3	3	3	5	3	5	3	5	3	5	3	3	3	3	2	3	2	
141	138	1.35	1.07	5	05	15	19	14			5		5	3	4	2			5	3			4	2	4	2	5	3	5	3	4	2									
142	139	1.26	1.01	5	07	19	13	19			3		4	2	4	2	3	1	3	1	4	2	4	2	5	3	5	3	5	3	5	3	5	3	5	3	5	3	5	3	
143	140	1.12	1.27	6	11	14	11	11																																	
144	141	1.30	1.41	6	05	18	11	11			4		3	2	4	3	4	2	4	2	4	3	2	2	3	3	3	2	4	3	5	3	5	3	5	3	5	3	4	2	
145	142	1.18	1.50	6	07	10	12	12			0																														
146	143	1.14	1.1	6	11	12	12	12			5		4	2	4	2			5	3					5	3	4	2	5	3	5	3	5	3							
147	144	1.08	1.12	6	00	00	00	00			0																														
148	145	1.05	1.31	6	03	15	12	09			3		4	3											3	2	0	0	5	3			5	3							
149	146	1.25	1.18	6	04	15	18	11			0																														
150	147	1.16	1.14	6	14	10	05	15			3		4	3	4	2			5	3			4	3	4		5	3									4	2	4	2	
151	148	1.03	1.16	6	00	00	00	00			0																														
152	149	1.33	1.31	6	00	00	00	00			2		4	3	4	2	3	2	3	3	4	3	3	2	1	1	4	3	4	3	5	3	5	3	5	3	3	2	3	2	
153	150	1.27	1.18	6	00	00	00	00			0																														
154	151	1.13	1.24	6	12	07	03	05			3		3	2	3	2	3	2	2	2	3	2	3	2	3	2	4	3	4	3	3	2	3	2	2	3	2	2	3	2	
155	152	1.09	1.14	6	12	12	17	13			0																														
156	153	1.33	1.28	6	10	16	12	11			0																														
157	154	0.74	0.95	7	08	16	13	14			0																														
158	155	1.00	0.97	7	13	17	15	17			0																														
159	156	0.92	0.95	7	04	17	13	09			2		4	3					4	2			4	2	3	1	4	2	3	1	4	2					4	2	3	1	
160	157	0.69	0.88	7	00	00	00	00			3		4	2	4	2			5	3			4	2	4	2					5	3									
161	158	0.94	0.97	7	11	17	11	11			3		4	2	5	2	3	2	3	2	4	2	2	1	4	2	4	2	5	3	5	3	4	2	5	3	5	3	4	2	
162	159	0.91	1.09	8	06	14	14	15			5		4	2	4	3			4	2			4	2	4	3	3	2	3	2								4	2		
163	160	0.50	1.08	8	08	14	12	12			0																														
164	161	0.89	1.03	8	11	16	12	09			4		4	3	4	2			5	3	4	2	4	2	4	2	5	3	5	3	4	3	4	3	4	2	4	2	4	2	
165	162	0.81	1.02	8	15	06	10	14			4		3	2	4	2	4	2	5	3	3	2	2	1	3	2	4	3	4	3	4	2	4	2	4	2	4	3	3	2	
166	163	0.94	1.08	8	12	13	10	13			3		4	2	4	2							3	2	2	1	5	3	5	3	5	3					4	2	4	2	
167	164	0.90	0.99	8	12	11	13	17			0																														
168	165	1.02	1.04	8	13	15	12	12			0																														
169	166	0.84	1.14	9	00	00	00	00			0																														
170	167	0.94	1.34	9	15	07	09	16			0																														
171	168	0.76	1.12	9	06	17	14	16			0																														
172													95	93	84	81	58	57	87	84	58	58	81	80	84	80	93	91	93	90	81	79	72	69	64	64	68	69	72	71	
173												Mean	3.76	2.40	3.79	2.22	3.17	1.91	4.01	2.49	3.59	2.12	2.91	1.84	3.31	2.08	4.09	2.56	4.28	2.69	4.22	2.53	3.96	2.41	3.97	2.41	3.44	2.19	3.38	2.04	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																														
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
174												S.D	0.9	0.6	0.8	0.6	0.8	0.5	0.8	0.6	0.9	0.7	0.9	0.6	1.0	0.6	1.0	0.6	0.7	0.5	0.7	0.5	0.9	0.7	0.9	0.6	0.9	0.6	0.8	0.5	
175													1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
176											CSA code 1		14	13	13	12	12	11	14	13	12	11	13	12	13	12	14	13	14	13	13	12	13	12	13	12	13	12	13	12	
177												2	23	22	19	18	10	9	19	17	8	8	18	17	19	18	24	23	24	23	21	19	18	17	13	13	14	15	16	16	
178												3	30	30	27	26	22	23	30	30	22	23	27	28	27	26	28	28	29	28	24	25	23	22	22	23	22	23	23	24	
179												4	8	8	8	8	5	5	6	6	6	6	6	6	6	6	8	8	8	8	7	7	6	6	6	6	6	6	6	5	
180												5	7	7	6	6	4	4	7	7	4	4	6	6	6	6	7	7	7	7	6	6	4	4	4	4	4	4	4	4	
181												6	6	6	5	5	3	3	5	5	3	3	4	4	6	5	6	6	5	5	4	4	5	5	3	3	4	4	4	4	
182												7	3	3	2	2	1	1	3	3	1	1	3	3	3	3	2	2	2	2	3	3	1	1	1	1	2	2	2	2	
183												8	4	4	4	4	1	1	3	3	2	2	4	4	4	4	4	4	4	4	3	3	2	2	2	2	3	3	4	4	
184												9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
185																																									
186																																									
187													1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	N=
188		0.647	0.134		Average	Average	Average	Average			Code	1	4.07	2.69	3.62	2.08	2.92	1.91	3.93	2.62	3.17	1.82	2.38	1.75	3.23	2.17	4.21	2.62	4.36	2.62	4.08	2.50	3.46	1.92	3.92	2.42	3.31	2.00	3.15	1.92	14
189		1.67	1.08		6.94	11.73	10.85	11.66				2	3.78	2.36	3.53	2.11	3.30	2.00	4.16	2.47	3.88	2.25	3.00	1.82	3.37	2.22	4.13	2.52	4.29	2.70	4.10	2.47	3.78	2.35	3.85	2.15	3.29	2.00	3.44	2.06	24
190												3	3.60	2.27	3.81	2.31	3.27	1.96	3.90	2.43	3.82	2.22	2.85	1.82	3.22	1.88	4.18	2.64	4.17	2.68	4.25	2.56	4.00	2.50	3.95	2.39	3.45	2.35	3.35	2.13	23
191		N=	% =		Average LSQ per CSA group							4	3.88	2.50	4.25	2.38	3.20	1.80	4.33	2.67	3.67	2.00	2.83	1.67	3.17	2.00	3.75	2.38	4.38	2.75	4.00	2.29	4.33	2.67	4.17	2.50	3.33	2.17	3.17	2.00	8
192		28	#REF!		7.13	12.04	10.52	12.28				5	3.57	2.43	3.83	2.33	2.75	1.50	3.86	2.29	2.75	2.00	3.67	2.17	3.83	2.50	4.29	2.86	4.43	2.71	4.67	2.67	4.75	2.75	4.00	2.75	3.50	2.25	3.75	2.25	7
193		42	#REF!		6.80	12.05	11.44	12.20				6	3.67	2.50	3.80	2.20	3.33	2.00	3.80	2.60	3.67	2.67	3.00	2.25	3.17	2.20	3.33	2.17	4.40	3.00	4.50	2.75	4.60	2.80	4.00	3.00	3.50	2.25	3.50	2.00	5
194		34	#REF!		6.91	13.29	12.44	12.68				7	4.00	2.33	4.50	2.00	3.00	2.00	4.00	2.33	4.00	2.00	3.33	1.67	3.67	1.67	4.00	2.00	4.00	2.00	4.67	2.67	4.00	2.00	5.00	3.00	4.50	2.50	3.50	1.50	3
195		12	#REF!		5.75	8.25	8.17	9.42				8	3.75	2.25	4.00	2.25	4.00	2.00	4.67	2.67	3.50	2.00	3.25	1.75	3.25	2.00	4.25	2.75	4.25	2.75	4.33	2.67	4.00	2.50	4.00	2.00	4.00	2.33	3.75	2.00	4
196		12	#REF!		6.67	12.42	10.42	10.83				9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
197		12	#REF!		6.08	8.08	7.58	7.33																																	
198		5	#REF!		7.20	13.40	10.40	10.20				S.D.																													N=
199		7	#REF!		11.00	12.71	11.86	13.14				1	0.96	0.46	0.74	0.76	0.86	0.51	0.80	0.62	0.69	0.57	0.62	0.60	0.97	0.69	0.77	0.49	0.61	0.49	0.62	0.50	1.08	0.64	0.62	0.64	0.61	0.58	0.66	0.49	14
200		3	#REF!		7.00	8.00	7.67	10.67				2	0.72	0.57	0.99	0.66	0.64	0.67	0.87	0.61	0.78	0.66	1.00	0.51	1.18	0.71	0.97	0.58	0.73	0.55	0.81	0.60	0.92	0.76	0.77	0.66	0.88	0.52	0.93	0.56	24
201		155										3	1.02	0.57	0.61	0.54	0.91	0.46	0.60	0.50	0.72	0.59	0.85	0.66	0.96	0.58	0.60	0.48	0.75	0.54	0.60	0.50	0.72	0.58	0.98	0.64	0.89	0.56	0.76	0.44	23
202												4	1.05	0.71	0.97	0.70	0.75	0.40	0.47	0.47	0.47	0.58	0.90	0.47	0.69	0.00	1.48	0.99	0.48	0.43	0.53	0.45	0.47	0.47	0.69	0.50	0.94	0.69	0.69	0.00	8
203												5	0.90	0.73	0.37	0.47	0.43	0.87	0.64	0.70	1.64	1.22	0.47	0.37	0.69	0.50	0.70	0.35	0.73	0.45	0.47	0.47	0.43	0.43	0.71	0.43	0.87	0.43	0.83	0.43	7
204												6	0.47	0.50	0.40	0.40	0.47	0.00	1.17	0.49	0.47	0.47	0.71	0.43	1.21	0.75	1.60	1.07	0.49	0.00	0.87	0.43	0.80	0.40	1.41	0.00	1.12	0.43	0.50	0.00	5
205												7	0.00	0.47	0.50	0.00	0.00	0.00	0.82	0.47	0.00	0.00	0.94	0.47	0.47	0.47	0.00	0.00	1.00	1.00	0.47	0.47	0.00	0.00	0.00	0.00	0.50	0.50	0.50	0.50	3
206												8	0.43	0.43	0.00	0.43	0.00	0.00	0.47	0.47	0.50	0.00	0.83	0.43	0.83	0.71	0.83	0.43	0.83	0.43	0.47	0.47	0.00	0.50	0.00	0.00	0.00	0.47	0.43	0.00	4
207												9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
208																																								
209										**Delivery**																														
210										**Interactive**																														
211										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
212										type	Prf	Hlp																												
213										1	4.01	2.41															4.21	2.62	4.36	2.62	4.08	2.50	3.46	1.92	3.92	2.42				
214										2	4.03	2.44															4.13	2.52	4.29	2.70	4.10	2.47	3.78	2.35	3.85	2.15				
215										3	4.11	2.55															4.18	2.64	4.17	2.68	4.25	2.56	4.00	2.50	3.95	2.39				
216										4	4.13	2.52															3.75	2.38	4.38	2.75	4.00	2.29	4.33	2.67	4.17	2.50				
217										5	4.43	2.75															4.29	2.86	4.43	2.71	4.67	2.67	4.75	2.75	4.00	2.75				
218										6	4.17	2.74															3.33	2.17	4.40	3.00	4.50	2.75	4.60	2.80	4.00	3.00				
219										7	4.33	2.33															4.00	2.00	4.00	2.00	4.67	2.67	4.00	2.00	5.00	3.00				
220										8	4.17	2.53															4.25	2.75	4.25	2.75	4.33	2.67	4.00	2.50	4.00	2.00				
221										9	####	####															####	####	####	####	####	####	####	####	####	####				
222																																							
223																																							
224										**Non-Interactive**																														
225										CSA																														
226										type	Prf	Hlp																												
227										1	3.33	2.14	4.07	2.69	3.62	2.08	2.92	1.91	3.93	2.62			2.38	1.75	3.23	2.17											3.31	2.00	3.15	1.92	
228										2	3.48	2.13	3.78	2.36	3.53	2.11	3.30	2.00	4.16	2.47			3.00	1.82	3.37	2.22											3.29	2.00	3.44	2.06	
229										3	3.43	2.14	3.60	2.27	3.81	2.31	3.27	1.96	3.90	2.43			2.85	1.82	3.22	1.88											3.45	2.35	3.35	2.13	
230										4	3.52	2.15	3.88	2.50	4.25	2.38	3.20	1.80	4.33	2.67			2.83	1.67	3.17	2.00											3.33	2.17	3.17	2.00	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																													
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
231										5	3.60	2.21	3.57	2.43	3.83	2.33	2.75	1.50	3.86	2.29			3.67	2.17	3.83	2.50											3.50	2.25	3.75	2.25	
232										6	3.47	2.25	3.67	2.50	3.80	2.20	3.33	2.00	3.80	2.60			3.00	2.25	3.17	2.20											3.50	2.25	3.50	2.00	
233										7	3.81	2.00	4.00	2.33	4.50	2.00	3.00	2.00	4.00	2.33			3.33	1.67	3.67	1.67											4.50	2.50	3.50	1.50	
234										8	3.83	2.16	3.75	2.25	4.00	2.25	4.00	2.00	4.67	2.67			3.25	1.75	3.25	2.00											4.00	2.33	3.75	2.00	
235										9	####	####	####	#####	####	#####	####	#####	####	#####			#DIV/0!	#####	####	####											####	####	####	####	
236																																									
237																																									
238										**Verbal**																															
239										CSA																															
240										type	Prf	Hlp																													
241										1	3.53	2.37	4.07	2.69									2.38	1.75	3.23	2.17	4.21	2.62	4.36	2.62							3.31	2.00	3.15	1.92	
242										2	3.71	2.61	3.78	2.36									3.00	1.82	3.37	2.22	4.13	2.52	4.29	2.70							3.29	2.00	3.44	2.06	
243										3	3.61	2.66	3.60	2.27									2.85	1.82	3.22	1.88	4.18	2.64	4.17	2.68							3.45	2.35	3.35	2.13	
244										4	3.60	2.56	3.88	2.50									2.83	1.67	3.17	2.00	3.75	2.38	4.38	2.75							3.33	2.17	3.17	2.00	
245										5	3.96	2.79	3.57	2.43									3.67	2.17	3.83	2.50	4.29	2.86	4.43	2.71							3.50	2.25	3.75	2.25	
246										6	3.51	2.58	3.67	2.50									3.00	2.25	3.17	2.20	3.33	2.17	4.40	3.00							3.50	2.25	3.50	2.00	
247										7	3.80	2.00	4.00	2.33									3.33	1.67	3.67	1.67	4.00	2.00	4.00	2.00							4.50	2.50	3.50	1.50	
248										8	3.75	2.75	3.75	2.25									3.25	1.75	3.25	2.00	4.25	2.75	4.25	2.75							4.00	2.33	3.75	2.00	
249										9	####	####	####	#####									#DIV/0!	#####	####	####	####	####	####	####							####	####	####	####	
250																																									
251																																									
252										**Visual**																															
253										CSA																															
254										type	Prf	Hlp																													
255										1	3.41	2.06			3.62	2.08	2.92	1.91			3.17	1.82													3.92	2.42					
256										2	3.64	2.13			3.53	2.11	3.30	2.00			3.88	2.25													3.85	2.15					
257										3	3.72	2.22			3.81	2.31	3.27	1.96			3.82	2.22													3.95	2.39					
258										4	3.82	2.17			4.25	2.38	3.20	1.80			3.67	2.00													4.17	2.50					
259										5	3.33	2.15			3.83	2.33	2.75	1.50			2.75	2.00													4.00	2.75					
260										6	3.70	2.47			3.80	2.20	3.33	2.00			3.67	2.67													4.00	3.00					
261										7	4.13	2.25			4.50	2.00	3.00	2.00			4.00	2.00													5.00	3.00					
262										8	3.88	2.06			4.00	2.25	4.00	2.00			3.50	2.00													4.00	2.00					
263										9	####	####			####	#####	####	#####			####	#####													####	####					
264																																									
265																																									
266										**Active**																															
267										CSA																															
268										type	Prf	Hlp																													
269										1	3.69	2.25													3.23	2.17	4.21	2.62	4.36	2.62	4.08	2.50	3.46	1.92	3.92	2.42	3.31	2.00	3.15	1.92	
270										2	3.77	2.33													3.37	2.22	4.13	2.52	4.29	2.70	4.10	2.47	3.78	2.35	3.85	2.15	3.29	2.00	3.44	2.06	
271										3	3.80	2.39													3.22	1.88	4.18	2.64	4.17	2.68	4.25	2.56	4.00	2.50	3.95	2.39	3.45	2.35	3.35	2.13	
272										4	3.73	2.32													3.17	2.00	3.75	2.38	4.38	2.75	4.00	2.29	4.33	2.67	4.17	2.50	3.33	2.17	3.17	2.00	
273										5	4.17	2.57													3.83	2.50	4.29	2.86	4.43	2.71	4.67	2.67	4.75	2.75	4.00	2.75	3.50	2.25	3.75	2.25	
274										6	3.86	2.45													3.17	2.20	3.33	2.17	4.40	3.00	4.50	2.75	4.60	2.80	4.00	3.00	3.50	2.25	3.50	2.00	
275										7	4.05	2.05													3.67	1.67	4.00	2.00	4.00	2.00	4.67	2.67	4.00	2.00	5.00	3.00	4.50	2.50	3.50	1.50	
276										8	3.98	2.43													3.25	2.00	4.25	2.75	4.25	2.75	4.33	2.67	4.00	2.50	4.00	2.00	4.00	2.33	3.75	2.00	
277										9	####	####													####	####	####	####	####	####	####	####	####	####	####	####	####	####	####	####	
278																																									
279																																									
280										**Passive**																															
281										CSA																															
282										type	Prf	Hlp																													
283										1	3.63	2.33	4.07	2.69	3.62	2.08	2.92	1.91	3.93	2.62																					
284										2	3.69	2.24	3.78	2.36	3.53	2.11	3.30	2.00	4.16	2.47																					
285										3	3.65	2.24	3.60	2.27	3.81	2.31	3.27	1.96	3.90	2.43																					
286										4	3.91	2.34	3.88	2.50	4.25	2.38	3.20	1.80	4.33	2.67																					
287										5	3.50	2.14	3.57	2.43	3.83	2.33	2.75	1.50	3.86	2.29																					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																								
2				CSA							PrvKn		Preference																												
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
288										6	3.65	2.33	3.67	2.50	3.80	2.20	3.33	2.00	3.80	2.60																				
289										7	3.88	2.17	4.00	2.33	4.50	2.00	3.00	2.00	4.00	2.33																				
290										8	4.10	2.29	3.75	2.25	4.00	2.25	4.00	2.00	4.67	2.67																				
291										9	####	####	####	#####	####	#####	####	#####	####	#####																				
292																																									
293																																									
294										**Lone**																															
295										CSA																															
296										type	Prf	Hlp																													
297										1	3.02	1.96											2.38	1.75	3.23	2.17											3.31	2.00	3.15	1.92	
298										2	3.27	2.03											3.00	1.82	3.37	2.22											3.29	2.00	3.44	2.06	
299										3	3.22	2.04											2.85	1.82	3.22	1.88											3.45	2.35	3.35	2.13	
300										4	3.13	1.96											2.83	1.67	3.17	2.00											3.33	2.17	3.17	2.00	
301										5	3.69	2.29											3.67	2.17	3.83	2.50											3.50	2.25	3.75	2.25	
302										6	3.29	2.18											3.00	2.25	3.17	2.20											3.50	2.25	3.50	2.00	
303										7	3.75	1.83											3.33	1.67	3.67	1.67											4.50	2.50	3.50	1.50	
304										8	3.56	2.02											3.25	1.75	3.25	2.00											4.00	2.33	3.75	2.00	
305										9	####	####											#DIV/0!	#####	####	####											####	####	####	####	
306																																									
307																																									
308										**Group**																															
309										CSA																															
310										type	Prf	Hlp																													
311										1	3.90	2.37	4.07	2.69							3.17	1.82					4.21	2.62	4.36	2.62	4.08	2.50	3.46	1.92	3.92	2.42					
312										2	3.97	2.40	3.78	2.36							3.88	2.25					4.13	2.52	4.29	2.70	4.10	2.47	3.78	2.35	3.85	2.15					
313										3	4.00	2.47	3.60	2.27							3.82	2.22					4.18	2.64	4.17	2.68	4.25	2.56	4.00	2.50	3.95	2.39					
314										4	4.02	2.44	3.88	2.50							3.67	2.00					3.75	2.38	4.38	2.75	4.00	2.29	4.33	2.67	4.17	2.50					
315										5	4.06	2.60	3.57	2.43							2.75	2.00					4.29	2.86	4.43	2.71	4.67	2.67	4.75	2.75	4.00	2.75					
316										6	4.02	2.70	3.67	2.50							3.67	2.67					3.33	2.17	4.40	3.00	4.50	2.75	4.60	2.80	4.00	3.00					
317										7	4.24	2.29	4.00	2.33							4.00	2.00					4.00	2.00	4.00	2.00	4.67	2.67	4.00	2.00	5.00	3.00					
318										8	4.01	2.42	3.75	2.25							3.50	2.00					4.25	2.75	4.25	2.75	4.33	2.67	4.00	2.50	4.00	2.00					
319										9	####	####	####	#####							####	#####					####	####	####	####	####	####	####	####	####	####					
320																																									
321																																									
322										**Mono-sensory**																															
323										CSA																															
324										type	Prf	Hlp																													
325										1	3.24	2.06	4.07	2.69	3.62	2.08	2.92	1.91					2.38	1.75													3.31	2.00	3.15	1.92	
326										2	3.39	2.06	3.78	2.36	3.53	2.11	3.30	2.00					3.00	1.82													3.29	2.00	3.44	2.06	
327										3	3.39	2.14	3.60	2.27	3.81	2.31	3.27	1.96					2.85	1.82													3.45	2.35	3.35	2.13	
328										4	3.44	2.08	3.88	2.50	4.25	2.38	3.20	1.80					2.83	1.67													3.33	2.17	3.17	2.00	
329										5	3.51	2.15	3.57	2.43	3.83	2.33	2.75	1.50					3.67	2.17													3.50	2.25	3.75	2.25	
330										6	3.47	2.20	3.67	2.50	3.80	2.20	3.33	2.00					3.00	2.25													3.50	2.25	3.50	2.00	
331										7	3.81	2.00	4.00	2.33	4.50	2.00	3.00	2.00					3.33	1.67													4.50	2.50	3.50	1.50	
332										8	3.79	2.10	3.75	2.25	4.00	2.25	4.00	2.00					3.25	1.75													4.00	2.33	3.75	2.00	
333										9	####	####	####	#####	####	#####	####	#####					#DIV/0!	#####													####	####	####	####	
334																																									
335																																									
336										**Multi-sensory**																															
337										CSA																															
338										type	Prf	Hlp																													
339										1	3.88	2.36							3.93	2.62	3.17	1.82					4.21	2.62	4.36	2.62	4.08	2.50	3.46	1.92	3.92	2.42					
340										2	4.02	2.42							4.16	2.47	3.88	2.25					4.13	2.52	4.29	2.70	4.10	2.47	3.78	2.35	3.85	2.15					
341										3	4.04	2.49							3.90	2.43	3.82	2.22					4.18	2.64	4.17	2.68	4.25	2.56	4.00	2.50	3.95	2.39					
342										4	4.09	2.46							4.33	2.67	3.67	2.00					3.75	2.38	4.38	2.75	4.00	2.29	4.33	2.67	4.17	2.50					
343										5	4.11	2.57							3.86	2.29	2.75	2.00					4.29	2.86	4.43	2.71	4.67	2.67	4.75	2.75	4.00	2.75					
344										6	4.04	2.71							3.80	2.60	3.67	2.67					3.33	2.17	4.40	3.00	4.50	2.75	4.60	2.80	4.00	3.00					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																													
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
345										7	4.24	2.29							4.00	2.33	4.00	2.00					4.00	2.00	4.00	2.00	4.67	2.67	4.00	2.00	5.00	3.00						
346										8	4.14	2.48							4.67	2.67	3.50	2.00					4.25	2.75	4.25	2.75	4.33	2.67	4.00	2.50	4.00	2.00						
347										9	###	###							###	#####	###	#####					###	###	###	###	###	###	###	###	###	###						
348																																									
349																																									
350										**Factor 1**																																
351										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
352										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
353										1	3.80	2.25									3.17	1.82							4.36	2.62	4.08	2.50	3.46	1.92	3.92	2.42						
354										2	3.98	2.39									3.88	2.25							4.29	2.70	4.10	2.47	3.78	2.35	3.85	2.15						
355										3	4.04	2.47									3.82	2.22							4.17	2.68	4.25	2.56	4.00	2.50	3.95	2.39						
356										4	4.11	2.44									3.67	2.00							4.38	2.75	4.00	2.29	4.33	2.67	4.17	2.50						
357										5	4.12	2.58									2.75	2.00							4.43	2.71	4.67	2.67	4.75	2.75	4.00	2.75						
358										6	4.23	2.84									3.67	2.67							4.40	3.00	4.50	2.75	4.60	2.80	4.00	3.00						
359										7	4.33	2.33									4.00	2.00							4.00	2.00	4.67	2.67	4.00	2.00	5.00	3.00						
360										8	4.02	2.38									3.50	2.00							4.25	2.75	4.33	2.67	4.00	2.50	4.00	2.00						
361										9	###	###									###	#####							###	###	###	###	###	###	###	###						
362																																									
363																																									
364										**Factor 2**																																
365										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
366										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
367										1	2.92	1.94											2.38	1.75	3.23	2.17													3.15	1.92		
368										2	3.27	2.04											3.00	1.82	3.37	2.22													3.44	2.06		
369										3	3.14	1.94											2.85	1.82	3.22	1.88													3.35	2.13		
370										4	3.06	1.89											2.83	1.67	3.17	2.00													3.17	2.00		
371										5	3.75	2.31											3.67	2.17	3.83	2.50													3.75	2.25		
372										6	3.22	2.15											3.00	2.25	3.17	2.20													3.50	2.00		
373										7	3.50	1.61											3.33	1.67	3.67	1.67													3.50	1.50		
374										8	3.42	1.92											3.25	1.75	3.25	2.00													3.75	2.00		
375										9	###	###											#DIV/0!	#####	###	###													###	###		
376																																									
377																																									
378										**Factor 3**																																
379										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
380										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
381										1	3.28	2.00			3.62	2.08	2.92	1.91																			3.31	2.00				
382										2	3.37	2.04			3.53	2.11	3.30	2.00																			3.29	2.00				
383										3	3.51	2.20			3.81	2.31	3.27	1.96																			3.45	2.35				
384										4	3.59	2.11			4.25	2.38	3.20	1.80																			3.33	2.17				
385										5	3.36	2.03			3.83	2.33	2.75	1.50																			3.50	2.25				
386										6	3.54	2.15			3.80	2.20	3.33	2.00																			3.50	2.25				
387										7	4.00	2.17			4.50	2.00	3.00	2.00																			4.50	2.50				
388										8	4.00	2.19			4.00	2.25	4.00	2.00																			4.00	2.33				
389										9	###	###			###	#####	###	#####																			###	###				
390																																									
391																																									
392										**Factor 4**																																
393										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
394										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
395										1	4.14	2.65	4.07	2.69													4.21	2.62														
396										2	3.95	2.44	3.78	2.36													4.13	2.52														
397										3	3.89	2.45	3.60	2.27													4.18	2.64														
398										4	3.81	2.44	3.88	2.50													3.75	2.38														
399										5	3.93	2.64	3.57	2.43													4.29	2.86														
400										6	3.50	2.33	3.67	2.50													3.33	2.17														
401										7	4.00	2.17	4.00	2.33													4.00	2.00														

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																													
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
402										8	4.00	2.50	3.75	2.25													4.25	2.75												
403										9	####	####	####	#####													####	####												
404																																								
405																																								
406										**Factor 5**																														
407										CSA			1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H	
408										type	Prf	Hlp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
409										1	3.93	2.62							3.93	2.62																	0.00	0.00			
410										2	4.16	2.47							4.16	2.47																	0.00	0.00			
411										3	3.90	2.43							3.90	2.43																	0.00	0.00			
412										4	4.33	2.67							4.33	2.67																	0.00	0.00			
413										5	3.86	2.29							3.86	2.29																	0.00	0.00			
414										6	3.80	2.60							3.80	2.60																	0.00	0.00			
415										7	4.00	2.33							4.00	2.33																	0.00	0.00			
416										8	4.67	2.67							4.67	2.67																	0.00	0.00			
417										9	####	####							####	#####																	0.00	0.00			
418																																									
419																																								
420										**Analysis of Previous Knowledge**																														
421										**CSA**		Raw numbers					N=	101																						
422										**Rating**		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**T**	**T%**																
423										**1**		1	1	0	0	1	1	0	0	0	-	4	4.0																
424										**2**		4	3	6	4	2	1	1	1	0	-	22	21.8																
425										**3**		5	2	6	8	3	3	3	2	1	-	33	32.7																
426										**4**		2	7	9	10	1	1	0	0	2	-	32	31.7																
427										**5**		1	1	3	1	1	1	1	0	1	-	10	9.9																
428																																									
429												Percentages/Group										N=																			
430										**CSA**	N=	13	14	24	23	8	7	5	3	4	0	101																	
431										**Rating**		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**																		
432										**1**		7.7	7.1	0.0	0.0	12.5	14.3	0.0	0.0	0.0	-																		
433										**2**		30.8	21.4	25.0	17.4	25.0	14.3	20.0	33.3	0.0	-																		
434										**3**		38.5	14.3	25.0	34.8	37.5	42.9	60.0	66.7	25.0	-																		
435										**4**		15.4	50.0	37.5	43.5	12.5	14.3	0.0	0.0	50.0	-																		
436										**5**		7.7	7.1	12.5	4.3	12.5	14.3	20.0	0.0	25.0	-																		
437																																								
438																																								
439																																								
440																																								
441										**The mean rating (Preferences) by CSA Groupings**																														
442										**Factor**			**1**			**2**			**3**			**4**			**5**			**Mean**												
443										**Analytic**			x	3.938		3.111			3.388			3.995			3.995			3.686												
444										**1,2,3**			SD	0.103		0.143			0.096			0.108			0.115			0.016	**SD**											
445																																									
446										**Intermediate**			x	4.154		3.343			3.500			3.747			3.997			3.748												
447										**4,5,6**			SD	0.057		0.296			0.100			0.181			0.115			0.083	**SD**											
448																																									
449										**Wholist**			x	4.175		3.458			4.000			4.000			4.333			3.993												
450										**7,8,9**			SD	0.158		0.042			0.000			0.000			0.333			0.127	**SD**											
451																																									
452										**Verbaliser**			x	4.080		3.160			3.625			3.985			4.087			3.787												
453										**1,4,7**			SD	0.220		0.247			0.295			0.135			0.176			0.055	**SD**											
454																																									
455										**Bimodal**			x	4.038		3.478			3.577			3.961			4.227			3.856												
456										**2,5,8**			SD	0.060		0.201			0.299			0.030			0.000			0.114	**SD**											
457																																									
458										**Imager**			x	4.136		3.181			3.529			3.695			3.850			3.678												

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO
1																																									
2				CSA							PrvKn		Preference																														
3	No.	WA score	VI score	code	Activist	Reflector	Theorist	Pragmatist					1	1-H	2	2-H	3	3-H	4	4-H	5	5-H	6	6-H	7	7-H	8	8-H	9	9-H	10	10H	11	11H	12	12H	13	13H	14	14H		
459										**3,6,9**			SD	0.097		0.041		0.015		0.195		0.050		0.063	**SD**																
460																																									
461																																									
462			Inter/Verb		Inter/Bim		Inter/Imag			Mean rating of each CSA type for each delivery mode																																	
463		Helpful/3	Pref/5	Helpful	Pref/5	Helpful/3	Pref/5	Helpful/3		**CSA type**			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**X**	**SD**																		
464		2.1429	3.5198	2.1469	3.5952	2.2143	3.4708	2.2500		**Qu**	**DM**	**1**	4.07	3.78	3.60	3.88	3.57	3.67	4.00	3.75	*	3.79	0.18																		
465		2.2845	3.8262	2.2325	3.6582	2.2551	3.8000	2.4595				**2**	3.62	3.53	3.81	4.25	3.83	3.80	4.50	4.00	*	3.92	0.32																		
466		2.3509	3.6369	2.2253	3.8878	2.4626	3.7238	2.4333				**3**	2.92	3.30	3.27	3.20	2.75	3.33	3.00	4.00	*	3.22	0.38																		
467		2.2711	3.9650	2.3683	3.6024	2.2595	3.7200	2.4600				**4**	3.93	4.16	3.90	4.33	3.86	3.80	4.00	4.67	*	4.08	0.29																		
468		2.1533	3.5139	2.1458	3.7401	2.2976	3.4611	2.2500				**5**	3.17	3.88	3.82	3.67	2.75	3.67	4.00	3.50	*	3.56	0.41																		
469		2.3618	3.9521	2.3708	3.6845	2.3586	3.7500	2.5167				**6**	2.38	3.00	2.85	2.83	3.67	3.00	3.33	3.25	*	3.04	0.38																		
470		2.1429	3.5198	2.1469	3.5952	2.2143	3.4708	2.2500				**7**	3.23	3.37	3.22	3.17	3.83	3.17	3.67	3.25	*	3.36	0.25																		
471												**8**	4.21	4.13	4.18	3.75	4.29	3.33	4.00	4.25	*	4.02	0.33																		
472												**9**	4.36	4.29	4.17	4.38	4.43	4.40	4.00	4.25	*	4.28	0.14																		
473												**10**	4.08	4.10	4.25	4.00	4.67	4.50	4.67	4.33	*	4.32	0.26																		
474												**11**	3.46	3.78	4.00	4.33	4.75	4.60	4.00	4.00	*	4.12	0.43																		
475												**12**	3.92	3.85	3.95	4.17	4.00	4.00	5.00	4.00	*	4.11	0.37																		
476		Whol/Bim		Whol/Imag								**13**	3.31	3.29	3.45	3.33	3.50	3.50	4.50	4.00	*	3.61	0.43																		
477		Pref/5	Helpful/3	Pref/5	Helpful/3							**14**	3.15	3.44	3.35	3.17	3.75	3.50	3.50	3.75	*	3.45	0.23																		
478		3.8333	2.1563	No data	No data																																				
479		4.0357	2.2262	No data	No data																																				
480		3.9048	2.3571	No data	No data																																				
481		4.0833	2.2333	No data	No data																																				
482		3.8194	2.1667	No data	No data																																				
483		4.0521	2.3333	No data	No data																																				
484		3.8333	2.1563	No data	No data																																				

CSA Sample Total - WA data				Note:																																					
Reference No.	Sex	Age	Median	Median	Mean	Mean	SD	SD	wa1	wa2	wa3	wa4	wa5	wa6	wa7	wa8	wa9	wa10	wa11	wa12	wa13	wa14	wa15	wa16	wa17	wa18	wa19	wa20	wa21	wa22	wa23	wa24	wa25	wa26	wa27	wa28	wa29	wa30	wa31	wa32	wa33	wa34
			W	A	W	A	W	A																																		
100	M	39	510	301	644	494	499	557	2630	923	653	917	478	1048	351	615	401	517	335	608	345	510	510	374	428	433	521	280	1641	2509	378	253	341	685	198	247	198	439	504	280	417	351
101	m	42	290	137	293	178	106	83	466	407	330	416	368	357	202	219	285	295	230	378	165	269	505	203	302	132	187	137	423	229	130	115	92	191	237	132	132	132	148	121	143	108
106	M	38	470	255	483	251	243	87	505	308	269	473	565	1187	203	379	654	467	383	680	549	731	478	213	433	165	817	198	341	126	187	192	361	373	192	142	460	258	341	258	302	169
108	M	50	220	145	282	180	162	91	582	587	411	526	280	566	346	236	204	180	158	198	132	164	242	153	330	104	137	103	433	235	148	121	109	307	246	109	253	158	142	103	103	154
10	F	29	460	197	475	292	244	170	994	455	516	291	378	839	313	506	248	896	664	460	142	571	592	132	675	208	460	164	550	252	110	121	599	471	285	197	493	114	169	176	522	269
112	M	40	403	189	452	325	291	309	939	522	417	671	307	1405	235	478	587	345	378	406	158	510	526	191	400	114	307	142	1454	746	171	423	258	566	208	137	461	142	198	158	121	312
117	M	41	1107	233	1005	251	462	102	2285	1186	1333	510	1185	1516	1317	779	691	1207	1092	1121	1214	669	889	592	462	411	1367	269	500	291	246	252	273	433	187	153	423	169	138	352	219	253
121	M	47	552	264	542	328	305	189	839	566	401	335	516	719	231	867	185	708	148	1280	631	669	186	538	731	191	944	148	894	477	257	286	176	670	258	264	544	153	280	158	494	203
122	M	46	928	345	899	389	499	181	1191	823	506	605	675	1653	335	1020	357	973	1038	1912	202	1187	1169	295	1560	132	1466	883	839	262	263	225	605	642	455	225	385	307	253	428	203	213
127	M	41	400	222	482	325	448	222	2285	379	401	835	400	616	242	291	307	517	204	532	203	433	444	208	554	137	528	137	884	649	219	439	225	433	159	160	462	119	187	181	169	241
133	m	31	239	121	299	165	182	108	873	521	318	428	367	565	142	296	219	341	180	237	132	214	241	148	148	136	357	115	549	115	121	115	121	302	153	187	137	103	115	126	110	136
137	m	35	475	269	460	307	199	103	1131	621	401	472	357	587	213	478	225	396	351	521	555	401	526	482	477	175	575	257	555	269	242	214	500	450	269	214	323	215	203	362	346	450
138	m	39	500	246	549	359	212	379	818	955	598	1153	614	696	478	423	466	566	374	450	373	521	526	555	439	378	269	323	1923	504	373	252	285	564	220	291	489	158	158	191	202	207
13	m	28	373	126	445	146	245	49	1355	571	439	631	383	390	329	346	280	330	351	609	219	296	361	362	427	471	625	130	247	115	158	186	120	120	98	203	87	148	114	132	94	208
148	M	40	370	216	388	272	136	132	819	460	532	532	269	467	378	362	296	281	275	346	263	313	378	494	301	411	396	182	603	153	164	317	160	296	191	323	373	176	241	154	130	176
151	M	41	233	153	275	203	125	125	720	362	324	312	196	252	202	230	284	208	180	235	225	203	467	268	285	159	230	153	401	153	153	317	148	614	121	153	149	346	137	114	247	153
154	M	43	601	381	621	399	307	125	1630	719	647	610	703	1164	378	665	664	471	346	504	411	603	841	599	346	323	522	280	555	257	394	462	351	406	330	307	642	351	247	285	176	373
16	f	29	305	161	352	224	196	133	351	467	258	296	275	614	235	412	302	923	158	352	164	307	610	158	476	116	466	99	351	246	132	241	169	313	203	137	119	198	323	143	142	509
171	m	24	158	117	186	155	95	88	532	225	235	262	175	182	120	147	126	280	131	109	114	125	230	132	202	108	110	169	274	108	110	114	98	385	131	120	125	114	208	99	142	400
175	m	36	733	362	1670	368	2462	160	9815	1257	5910	5673	779	2328	753	714	280	637	292	1417	170	395	933	329	493	137	978	110	383	423	180	132	401	669	394	182	687	231	341	198	329	296
176	x	0	301	200	315	218	101	74	483	296	450	291	328	429	214	280	214	423	175	264	367	280	308	533	307	225	307	136	451	248	138	164	125	268	169	154	257	235	291	191	137	219
178	m	40	609	316	764	542	438	484	1971	1301	1164	1148	549	1312	1075	730	944	341	444	878	285	669	537	411	454	312	416	341	2009	658	253	340	291	1685	319	312	866	214	280	187	582	269
180	M	46	491	222	630	232	653	77	3218	632	471	647	632	1467	473	614	378	401	208	516	169	537	467	510	307	191	616	142	423	203	187	213	142	400	247	153	296	164	165	236	164	242
21	m	39	227	145	254	203	148	141	703	275	132	301	241	351	108	521	176	213	175	341	130	368	291	165	164	87	258	88	516	647	120	148	152	257	142	98	116	126	115	98	186	191
22	M	36	305	192	331	236	173	127	505	839	246	351	400	598	186	275	192	296	198	543	186	341	351	192	314	121	351	137	648	351	142	186	164	275	220	198	428	176	181	132	203	242
25	M	48	247	131	364	159	386	81	1789	242	192	1087	268	312	187	235	180	252	137	537	137	341	192	148	307	302	325	114	335	175	202	142	105	423	198	110	169	110	103	169	126	103
29	M	43	488	250	599	295	433	134	652	494	307	367	482	883	158	587	208	669	291	1158	137	1049	1307	241	1125	147	1592	116	307	532	269	301	213	653	218	367	434	456	225	175	116	202
2	x	44	225	167	264	184	140	93	653	121	318	319	379	241	345	263	175	142	149	460	169	208	493	274	142	176	126	136	521	257	103	181	126	264	192	99	280	137	137	148	115	176
36	M	39	472	208	553	284	343	190	1450	812	950	725	775	1010	307	444	323	367	185	757	169	592	812	158	500	154	412	154	907	253	153	137	114	560	165	181	410	208	148	176	185	208
49	m	48	326	222	745	269	1470	155	7019	1329	978	983	450	351	312	171	346	417	273	356	198	225	339	209	291	192	312	159	598	400	213	126	181	192	346	262	225	149	119	105	219	137
50	m	43	466	227	475	248	227	75	753	466	191	487	335	906	312	714	362	608	291	725	165	467	533	285	708	225	807	163	423	307	197	203	235	339	307	225	383	142	251	198	230	230
52	m	35	1062	562	1208	1072	699	1095	2653	1423	681	791	1000	1125	669	994	1423	1817	516	2703	500	2038	1136	444	1389	445	2011	401	538	2697	269	665	564	4267	1317	648	2526	269	284	560	247	467
55	m	36	423	239	501	303	409	175	2087	691	812	658	198	423	367	511	433	658	241	637	286	269	334	175	444	423	275	104	912	329	176	219	165	576	253	219	472	197	318	225	312	214
61	m	46	129	95	148	108	64	48	330	165	148	169	323	175	126	119	132	116	158	115	132	98	121	115	92	142	87	87	313	88	105	105	76	116	98	82	92	76	92	126	93	104
66	f	49	381	194	383	226	156	121	505	440	373	632	389	505	411	257	323	652	455	494	269	269	291	153	341	137	642	121	324	246	125	119	158	478	119	132	576	246	175	154	109	264
77	m	40	460	334	482	415	168	202	500	746	566	526	516	614	440	335	389	471	383	483	412	817	851	246	450	247	407	241	548	356	323	1158	296	616	285	346	548	286	308	312	296	362
85	m	46	656	285	962	353	761	236	2592	1269	3373	1158	1158	1389	1121	603	526	555	494	1044	791	516	648	330	532	247	664	241	1119	229	378	280	405	522	566	462	247	192	98	675	306	483
90	m	36	244	167	278	206	188	109	939	367	357	422	169	246	121	158	175	149	121	476	241	268	296	253	181	110	428	87	517	389	164	176	98	357	126	142	116	164	116	104	92	219
91	m	39	337	210	353	264	241	180	1066	433	142	328	367	780	148	407	163	307	164	412	218	346	466	125	648	97	346	94	297	214	149	159	121	681	207	116	797	153	219	142	180	165
94	m	40	301	173	381	224	221	132	894	752	213	301	340	592	153	500	180	262	153	774	301	330	621	230	335	252	291	136	373	363	137	92	148	637	198	175	357	180	176	119	148	153
107	m	43	881	219	1042	284	661	169	2844	1372	1251	2571	927	1641	857	889	626	874	812	1225	971	275	1258	725	482	384	559	291	603	500	225	137	181	797	187	291	323	219	361	169	158	187
114	m	26	255	189	351	232	249	113	1098	784	785	394	383	390	176	169	203	389	137	214	325	291	171	132	202	187	219	367	494	241	191	187	186	219	132	158	148	164	126	319	549	158
115	m	42	260	145	265	165	131	74	587	307	275	427	257	505	187	312	142	237	137	351	108	335	203	262	149	98	334	92	401	230	138	121	116	335	164	109	197	121	109	103	148	120
124	M	40	705	188	656	306	398	233	714	1274	396	383	862	1433	329	846	303	1423	214	960	335	696	746	231	829	198	846	115	575	400	131	180	132	576	164	230	687	132	229	180	196	268
128	m	40	351	170	386	240	206	155	785	500	208	317	351	977	334	488	317	363	175	395	116	367	499	269	351	242	560	110	719	516	158	219	258	494	153	164	147	158	126	137	264	180
130	m	30	228	145	226	163	97	59	516	285	301	231	160	325	126	257	169	196	164	301	121	235	323	131	226	116	247	98	257	164	158	132	137	229	132	147	132	136	142	115	170	109
136	f	31	164	120	192	155	144	72	692	242	181	203	242	367	121	121	126	5	0	258	99	164	165	110	208	153	295	98	280	208	105	103	99	285	121	115	187	120	171	98	109	164
141	M	40	549	233	608	304	352	179	943	1000	708	263	526	1169	319	835	346	862	571	1230	132	1016	850	158	450	132	483	176	439	214	110	270	114	196	516	192	598	752	158	175	592	251
146	M	48	231	156	247	166	108	54	676	242	208	280	286	241	237	198	218	246	198	284	214	198	297	225	253	148	191	105	346	163	182	153	142	268	148	110	158	109	136	148	160	119
150	m	45	464	128	499	187	279	123	1033	1016	423	516	489	983	241	582	346	828	284	719	137	478	537	264	451	125	379	148	610	158	175	126	114	275	125	115	362	110	110	121	192	99
152	m	42	313	156	589	379	608	732	1812	533	324	2411	735	1477	301	566	588	950	241	142	171	121	257	328	268	169	241	142	1050	149	148	114	110	3448	164	198	164	116	116	130	237	219
160	m	37	305	222	507	275	572	128	2762	532	626	1092	834	517	505	416	537	341	215	185	252	164	182	187	269	170	192	171	330	405	198	258	182	685	158	203	308	148	269	220	258	220
163	m	36	263	145	298	205	156	158	362	297	336	605	467	703	323	450	230	357	192	231	285	154	235	109	241	105	197	92	246	165	142	137	230	828	137	142	352	92	98	93	159	203
164	m	41	631	309	736	329	607	158	2883	669	966	466	708	1615	510	592	264	686	198	1049	176	851	960	186	571	401	823	142	566	346	253	142	390	532	389	374	544	148	158	160	323	295
165	M	46	271	192	324	227	148	106	725	466	367	351	262	494	186	198	237	181	251	510	317	434	489	208	208	154	279	164	543	433	280	203	126	274	138	180	346	225	176	214	137	187
167	f	48	285	183	334	243	150	150	879	433	407	428	279	405	202	268	312	290	275	455	241	374	274	176	198	341	214	237	439	241	125	125	131	137	664	258	489	125	169	132	443	198
168	M	37	293	198	337	240	159	102	791	445	279	384	339	455	218	275	246	291	208	626	142	295	521	235	307	125	220	330	467	198	143	143	137	460	175	191	214	148	185	253	198	280
169	m	46	505	250	520	280	198	139	1202	500	416	510	395	692	560	621	307	698	241	620	548	477	351	516	423	582	421	323	11	686	175	258	169	197	400	275	208	176	258	235	235	242
17	m	39	241	169	254	190	123	85	653	312	214	268	334	328	192	257	230	269	148	394	207	367	251	132	121	180	130	98	438	164	181	132	110	258	192	121	131	98	169	132	104	182
181	m	38	508	198	570	220	322	96	1191	944	773	707	510	730	385	417	214	416	412	833	1368	505	603	241	532	192	275	149	483	296	218	130	137	378	252	230	357	165	126	115	264	181
182	m	31	203	132	225	155	98	62	462	208	149	225	275	472	160	208	235	285	137	340	121	196	253	148	198	114	180	142	373	126	153	132	119	268	114	132	126	110	158	132	149	208
24	M	48	526	189	530	240	276	115	950	598	373	791	526	910	252	621	182	439	218	907	241	714	895	230	834	198	526	187	451	487	158	115	335	401	198	181	324	158	198	180	202	132
32	m	46	491	280	622	432	338	308	1037	1141	357	505	758	1394	263	784	621	1108	471	998	477	450	478	269	367	202	527	231	1290	939	252	237	242	632	230	225	439	182	296	214	1016	264

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wa35	wa36	wa37	wa38	wa39	wa40	wa1	wa2	wa3	wa4	wa5	wa6	wa7	wa8	wa9	wa10	wa11	wa12	wa13	wa14	wa15	wa16	wa17	wa18	wa19	wa20	wa21	wa22	wa23	wa24	wa25	wa26	wa27	wa28	wa29	wa30	wa31	wa32	wa33	wa34	wa35	wa36	wa37	wa38	wa39	wa40	Mean	WA ratio	CSA type
291	219	219	218	186	312	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.690815	1
148	285	246	116	114	312	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0.950	2.112057	1
252	192	203	268	141	264	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.840214	1
328	225	142	87	105	94	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.515436	1
198	608	158	192	176	176	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	2.332016	1
148	158	116	181	119	428	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	2.125515	1
192	170	180	285	153	142	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	4.743096	1
301	313	208	158	191	264	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	2.090976	1
214	482	703	383	252	444	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.950	2.687394	1
357	142	116	346	198	818	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.800702	1
109	153	115	94	92	339	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.977419	1
285	246	313	269	197	219	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.762319	1
280	225	32	241	219	367	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	2.02692	1
148	105	103	171	105	251	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	2.952086	1
505	263	175	176	489	367	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.710811	1
158	126	116	99	116	241	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.520356	1
389	520	412	346	521	664	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.575448	1
153	115	142	121	103	610	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.884198	1
126	131	114	98	94	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.348259	1
439	257	455	214	555	592	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0.950	2.023707	1
317	236	208	181	192	181	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.505355	1
312	960	400	202	444	258	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.950	1.928925	1
329	230	153	182	241	280	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.925	2.213532	1
334	109	136	253	109	202	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.950	1.558233	1
148	401	165	115	137	202	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.587817	1
120	136	137	92	119	98	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.877037	1
164	230	170	181	319	362	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.953906	1
169	180	202	87	165	142	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.925	1.342657	1
192	588	301	269	275	246	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	2.260748	1
725	180	268	307	367	269	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.950	1.464505	1
202	346	219	171	165	181	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	2.052361	1
2817	1516	643	433	312	394	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.975	1.889583	1
394	148	165	191	307	274	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.925	1.769608	1
92	92	109	87	115	105	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.950	1.353061	1
324	257	213	114	241	136	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.958877	1
296	274	462	280	351	597	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.975	1.376093	1
219	291	158	108	120	196	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0.900	2.297538	1
230	169	198	242	158	334	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0.925	1.459743	1
236	367	142	242	214	471	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.6	1
141	165	170	219	114	417	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.742954	1
301	218	159	158	126	373	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.925	4.01959	2
236	357	230	126	247	165	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0.875	1.348454	2
153	158	137	148	153	142	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.789262	2
142	473	169	115	137	1000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	3.735264	2
262	175	148	105	126	296	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	2.066514	2
136	186	164	92	159	367	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.975	1.575269	2
116	131	137	103	88	362	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.364078	2
296	319	142	165	203	374	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0.925	2.356245	2
158	132	191	121	170	196	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.479401	2
130	176	103	198	92	351	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.975	3.604545	2
275	180	142	121	120	384	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.998753	2
516	334	196	219	171	225	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.950	1.370175	2
141	142	187	148	125	323	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.803213	2
719	390	158	219	185	291	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0.975	2.038461	2
130	180	137	148	198	291	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.408722	2
231	208	346	126	119	148	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.925	1.549894	2
187	412	280	202	158	367	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.481262	2
423	433	275	285	467	187	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.950	2.020297	2
334	148	175	319	235	169	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0.975	1.42069	2
187	274	208	114	131	158	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	2.565089	2
114	176	137	98	116	153	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.538462	2
280	407	175	109	169	142	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.950	2.778579	2
346	264	317	394	175	685	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.975	1.752786	2

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| CSA Sample Total - VI data | | |

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i13	i14	i15	i16	i17	i18	i19	i20	i21	i22	i23	i24	v1	v2	v3	v4	v5	v6	v7	v8	v9	v10	v11	v12	v13	v14	v15	v16	v17	v18	v19	v20	v21	v22	v23	v24	i1	i2	i3	i4	i5	i6	i7	i8	i9	i10	i11	i12	i13	i14	i15	i16	i17	i18	i19	i20	i21	i22	i23	i24	Mean	VI score	CSA type
498	362	281	707	378	868	312	682	357	455	923	517	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0.896	0.9445717	1
225	218	592	209	274	286	246	185	235	208	346	362	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.813	0.9579609	1
374	385	385	1373	329	764	308	346	262	505	571	703	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	0.8866646	1
158	170	132	285	405	314	137	248	187	406	275	433	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.958	0.8112779	1
170	251	197	379	456	301	273	182	346	241	526	564	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.750	0.9734393	1
378	203	522	1598	472	313	269	208	603	466	1038	450	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.958	0.8701851	1
575	753	390	400	351	476	374	455	488	592	708	857	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	0	0	0	1	0.833	0.9397705	1
262	533	285	571	291	378	291	455	341	406	334	462	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0.938	0.9795686	1
291	432	423	599	527	433	334	603	339	323	669	1214	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.979	0.953533	1
538	373	169	713	625	494	396	450	801	407	1060	488	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.833	0.9524002	1
275	279	433	434	291	264	218	230	335	303	252	280	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.958	0.9517516	1
308	439	357	560	483	433	273	346	555	329	493	658	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	0.9804034	1
312	982	418	702	467	2032	1581	1000	2476	1213	1455	664	1	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1	1	1	0	1	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.750	0.974331	1
395	510	235	1828	291	389	504	367	214	747	334	549	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.938	0.8511317	1
218	246	253	351	242	263	264	301	180	285	362	367	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.9056187	1
324	346	352	373	242	361	653	341	851	275	648	351	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0.896	0.9665177	1
455	505	489	394	582	439	533	685	587	610	1071	632	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	0	0	1	0.729	0.9496429	1
319	362	280	433	319	319	383	235	307	378	401	330	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.9745827	1
192	264	153	374	312	185	180	291	198	258	280	423	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.938	0.8905911	1
489	264	494	526	341	198	192	291	367	280	467	526	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.938	0.9830672	1
412	416	235	592	455	291	280	444	246	312	423	433	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.860104	1
938	285	653	550	570	319	351	1152	362	417	407	780	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	0.813	0.8326131	1
615	599	499	675	389	439	346	489	621	460	987	367	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0.938	0.9684387	1
444	208	297	280	319	307	219	345	285	324	466	346	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.8281873	1
198	219	642	592	225	251	214	231	341	340	340	394	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.9310723	1
148	285	280	280	247	110	153	92	98	105	132	308	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.958	0.9505564	1
297	405	692	1185	483	641	335	774	592	462	575	927	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.9758271	1
160	229	510	345	314	153	394	132	175	296	405	257	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0.854	0.8816572	1
301	906	1032	774	253	357	411	262	450	317	1020	412	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.979	0.9547743	1
658	1075	505	532	883	967	532	1214	532	1032	812	1214	1	1	0	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	1	1	0.771	0.9757089	1
471	312	280	423	230	203	614	235	1461	373	341	280	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0.875	0.8449903	1
285	610	676	1253	483	460	291	642	605	571	537	769	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	0.9701404	1
851	444	319	692	560	587	385	835	614	763	6551	1482	0	1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	0	0	1	1	1	1	1	1	0	1	1	0	1	0	1	1	0	0	1	0	1	1	0	0	1	0	0.625	0.8450298	1
181	121	132	175	126	109	110	87	516	103	132	108	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0.854	0.9550957	1
319	281	296	357	281	176	187	203	202	544	264	500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.9088182	1
351	714	982	1653	1016	357	383	609	423	632	405	621	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0.917	0.8374286	1
813	396	680	901	334	537	587	225	576	560	537	900	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	0	0.833	0.9828709	1
296	401	510	676	526	191	214	498	428	346	297	379	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0.917	0.8661517	1
253	137	158	301	251	182	110	246	323	280	291	439	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.917	0.9204357	1
191	296	532	312	423	214	231	215	230	285	291	493	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.958	0.8852001	1
269	555	773	401	421	762	219	505	412	346	362	467	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0.813	0.990805	2
478	335	357	473	235	357	207	301	351	324	285	291	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.938	1.032766	2
433	301	478	323	703	357	451	526	565	455	626	505	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	1	1	0	0	0.771	1.05388	2
373	592	275	330	219	450	341	219	230	296	323	378	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.063736	2
208	208	141	351	207	235	169	246	191	275	439	323	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	1.067481	2
191	944	191	389	301	275	444	269	323	274	285	269	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	1.082156	2
182	241	175	351	214	252	203	279	214	291	401	351	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.979	0.9976484	2
516	439	608	575	675	269	401	417	632	631	989	599	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0.896	1.012728	2
246	208	170	433	182	477	170	285	218	252	312	235	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0.917	1.02484	2
330	357	214	1323	483	494	719	494	455	817	494	582	0	0	1	1	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	0.750	1.048509	2
252	477	291	357	285	203	196	192	252	291	350	241	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0.833	1.009552	2
273	312	620	609	319	330	285	274	368	603	489	394	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0.938	1.101496	2
158	731	312	416	197	225	242	263	187	280	335	346	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.021834	2
153	444	269	632	220	165	307	142	169	318	214	202	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0.979	1.088171	2
401	241	291	637	373	296	246	394	319	317	516	390	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.000	1.054785	2
367	417	433	863	417	610	439	451	698	440	571	735	1	1	1	0	0	1	0	1	1	1	1	1	1	0	1	1	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.771	1.048139	2
330	312	476	433	500	258	301	406	357	851	599	301	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.813	0.9992059	2
571	257	169	1026	1465	225	378	214	352	428	401	373	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	0.833	1.044315	2
307	367	345	301	246	257	180	428	341	230	246	323	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0.896	1.047846	2
411	483	262	312	285	235	428	246	521	214	334	696	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1

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CSA Data for DCC Students